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MINISTRY OF PUBLIC HEALTH, EGYPT

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THE RESEARCH INSTITUTE AND THE  
ENDEMIC DISEASES HOSPITAL

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SIXTH ANNUAL REPORT  
1936

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CAIRO  
GOVERNMENT PRESS, BULÂQ  
1940

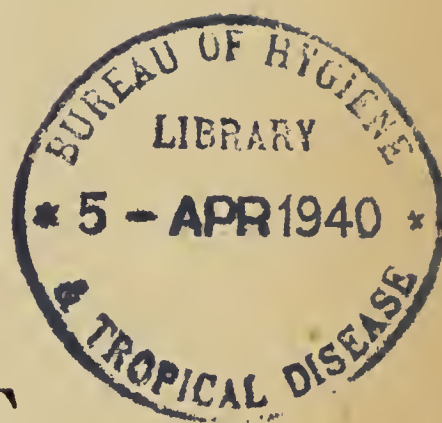


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EXCELLENCY,

I have the honour to submit my report on the Research Institute and the Endemic Diseases Hospital and the work done during the year 1936.

CAIRO, *September 1936*

I have the honour to be,  
Excellency,

Your obedient servant,

DR. M. KHALIL,  
*Director, Research Institute.*

H.E. THE UNDER-SECRETARY OF STATE,  
MINISTRY OF PUBLIC HEALTH,  
CAIRO.

Please note that the name of our Institute was changed  
as follows:—

“Fouad I Institute and Hospital for Tropical Diseases”



THE RESEARCH INSTITUTE AND THE ENDEMIC  
DISEASES HOSPITAL, CAIRO

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Staff

*Director :*

DR. MOHAMMED BEY KHALIL, M.D. (Egypt), Ph.D. (London),  
M.D. (Brux.), M.R.C.P. (London), D.P.H. (Oxford),  
D.T.M. & H. (England), L.R.C.P. (London).

*Biochemist :*

DR. ALI HASSAN, M.Sc., Ph.D. (Liverpool).

*Protozoologist :*

DR. MAHMOUD ABDEL-AZIM, M.B., Ch.B., (Egypt), D.T.M. & H.  
(England).

*Entomologist :*

DR. SAADALLA MADWAR, M.B., Ch.B., (Edinburgh), D.T.M. & H.  
(England), Ph.D. (Cantab.).

*Clinical Pathologist and Physicians :*

DR. MAHMOUD SALAH-EL-DIN, M.B., Ch.B. (Egypt), M.R.C.P.  
(London), D.T.M. & D.T.H. (Liverpool).

*Bacteriologist :*

DR. MOHAMMED HUSSEIN EL-BETACHE, M.B., Ch.B. (Egypt),  
D.P.H., D.T.M. & H. (Egypt).

*Medical Assistants to the Hospital :*

DR. MAHMOUD ABDEL-KERIM EL-MAKRAHY, M.B., Ch.B. (Egypt),  
D.P.H., D.T.M. & H. (Egypt).

DR. ISSA ISMAIL ISSA, M.B., Ch.B. (Egypt).

DR. MOHAMMED FAT-HALLA ATTIA EL-ASHKAR, M.B., Ch.B.  
(Egypt).

*Khanka Malaria Research Station :*

DR. MOHAMMED FAKHR-EL-DIN EL-SOBKY, M.B., Ch.B. (Egypt),  
Diploma of Malaria (Rome).

*Sanitary Engineer :*

ABDEL-RAHMAN EL-SAYED KHODEIR EFF.



## FOREWORD

The Research Institute in its 6th year of existence continued its activity in its different departments. The outline of the work in each department is detailed in the present report.

Attention is drawn particularly to the work dealing with the relationship of the excretory power of the kidney and the therapeutic effect of the Antimony treatment in Schistosomiasis. Pyrocatechin disulphonate of sodium was found to be a very good kidney function test.

The village of Tanan near Cairo was reported to the Institute as having an increase in mortality without a definite cause.

Investigation revealed that intestinal Schistosomiasis was the main cause. The infection was traced principally to an irrigation canal passing through the village. The sewage of a mosque was secretly allowed to flow into the canal by a hidden pipe. The report reveals clearly the ravages of the disease.

The experiment of Schistosomiasis control in Dakhla Oasis is reported upon after the lapse of six years. The result was very satisfactory. None of the seven children born after the treatment of the irrigation channel with copper sulphate in 1930 were infected.



# MINISTRY OF PUBLIC HEALTH, EGYPT

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## The Research Institute and the Endemic Diseases Hospital

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### Sixth Annual Report, 1936

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#### SECTION I.—Biochemistry

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##### THE TOXICITY OF ANTIMONY FOLLOWING THE INJECTION OF FOUADIN

The death of a boy while undergoing treatment with Fouadin which occurred in the Research Institute, was the cause of this series of investigations.

The boy received 8 injections of Fouadin; a quarter of an hour after the last injection he was found in a state of collapse and in spite of all medical aid he died.

The post-mortem examination revealed negative results. The chemical analysis of the organs carried out by the Medico-legal Department showed that the liver contained an amount of antimony equal to the last three injections.

The subject was discussed in a meeting of the Egyptian Society of Endemic Diseases and Tropical Medicine, and it was concluded that the explanation of the occurrence could be found in the fact that individuals may vary in their power of excretion of antimony. It was, therefore, important to investigate whether there was any possible variation in the rate of the excretion of antimony in different individuals. It was essential to find an easy test for the detection and estimation of the antimony in the urine which could be applied on a large scale. As the chemical tests for antimony are too laborious to be of value in practice and as the complex Fouadin molecule contains a pyrocatechin molecule, the urines of patients undergoing Fouadin treatment were tested for the pyrocatechin radicle using the well-known pyrocatechin reaction.

It was found that following the injection of Fouadin a compound is excreted in the urine which gives the pyrocatechin reaction. This compound could be found in the urine of some of the patients as early as 15 minutes following the injection, while in others it could



only be demonstrated after some hours. Tests for antimony carried out by the Reinsch test showed that antimony is excreted at the same time and that its concentration runs roughly parallel with the concentration of the compound giving the pyrocatechin reaction.

The results of these experiments were published in a preliminary report in which it was stated that :—

(1) Individuals vary in the rapidity of the excretion of Fouadin; thus cases may show a positive test within 15 minutes of the intramuscular injection of Fouadin, while others fail to show a positive reaction within 24 hours.

(2) The delay in excretion corresponds to the kidney efficiency as tested by the urea concentration test, blood urea, etc.

(3) The necessity for finding an easy test for the actual estimation of antimony was emphasized.

This preliminary report necessitated the following investigations :—

(a) Whether the above test could be used for the accurate estimation of antimony in the urine.

(b) Whether it could be used as a kidney function test. In what form is Fouadin excreted in the urine.

(c) A quantitative study of the excretion of antimony.

(a) Estimations of the complex compound giving the pyrocatechin reaction and the actual and the accurate estimation of antimony were carried out on urines of patients receiving Fouadin injections.

For the actual estimation of antimony a method has been worked which gives an accuracy of about 90 per cent. As to the complex compound, giving the pyrocatechin reaction, this was estimated colorimetrically and the results were expressed as if it were in the form of unchanged Fouadin. Results are shown in Tables 4 and 5.

Table 4, giving results of the estimations of antimony and the complex compound found in the urine one hour and three hours after the Fouadin injection shows that the excretion of antimony and of the complex compound runs roughly parallel.

In Table 5, showing the excretion of 4, 8, 12 and 24 hours after the injection, a relationship between the excretion of the two compounds is at first demonstrable; but after the first 12 hours this relationship could not be established any more, as the complex compound ceases to be excreted earlier than the antimony.



We have not yet been able to find any easy method for the estimation of antimony which could be used on a large scale.

(b) In what form is Fouadin excreted in the urine ?

To investigate this question the urines passed after the injection of Fouadin were shaken with the following substances and filtered:—

- (1) Animal charcoal.
- (2) Kaolin.
- (3) Kieselghur.
- (4) Fullers' earth.

The urines used were acid in reaction.

The original urines together with the filtrates were tested for pyrocatechin compounds by the  $\text{FeCl}_3$  test and for antimony by the Reinsch test.

It was found that only by using animal charcoal most of the complex compound giving the pyrocatechin reaction could be removed from such urines.

In the following experiments 100 c.c. of urine (acid in reaction) were shaken for 10 minutes with varying amounts of animal charcoal (Khalbaum charcoal pro-analysis from bone).

The results of the  $\text{FeCl}_3$  test and of the antimony estimations carried out on such urines are shown in the following table:—

TABLE 1

	$\text{FeCl}_3$	sb in Mgrms.
100 c.c. urine shaken with 1 gramme charcoal	+++	0.75
„ „ „ 5 grammes ... ..	+	0.65
„ „ „ 10 „ ... ..	+	0.4
„ „ „ 15 „ . ... ..	very minute traces	0.35
Original urine ... ..	+++	0.75

The above experiment was repeated on several urines and all gave similar results. Hence animal charcoal could be used for the removal of almost all the complex compound excreted in the urine while the antimony present is only slightly affected.

As a result of this experiment it is conceivable, that a pyrocatechin radicle is split off and an antimony compound and a pyrocatechin compound are excreted in the urine.

In order to elucidate this point further the following ultra-violet absorption spectra were examined :—

The ultra-violet absorption spectra of Fouadin, pyrocatechin disulphonate of soda and of the compounds excreted in the urine following their injection :—

Hilger Juartz spectroscope with a Spekker Photometre and a condensed spark between tungsten electrodes was used.

Both Fouadin and pyrocatechin disulphonate of soda diluted in distilled water were examined :—

*Fouadin* shows the following :—

A well-defined broad band	...	...	...	...	$\lambda$ max. 304·5
					$\lambda$ min. 273
A smaller band	...	...	...	...	$\lambda$ max. 248·7
					$\lambda$ min. 243·5

*Pyrocatechin* disulphonate of soda :—

A well-defined broad band	...	...	...	...	$\lambda$ max. 291
					$\lambda$ min. 285
A smaller band	...	...	...	...	$\lambda$ max. 232·5
					$\lambda$ min. 224·5

The absorption bands of the two compounds are similar except that with Fouadin (the compound with a higher molecular weight) the bands are shifted towards the longer wave-length of the spectrum.

As regards the compounds excreted in the urine following the injection of either Fouadin or pyrocatechin disulphonate of soda; great difficulties are encountered owing to the presence of many actinic substances in the urine. However, after several experiments it was found that if the urines are treated with animal charcoal and filtered, most of the interfering substances are removed. The animal charcoal absorbs also the greater part of the pyrocatechin compound, yet the small amount left over after the removal of other interfering substances showed definite absorption bands (see Tables 2 and 3).

Several Bilharzial urines as well as many pooled Bilharzial urines of untreated patients when shaken with animal charcoal, did not show selective absorption even when the filtrates were used undiluted, but the light is cut completely at a wave length shorter than 2350 A°.



1.—*Urices passed Following the Injection of Fouadin.*

Urices (acid in reaction) were shaken with animal charcoal (15 grammes. per 100 c.c.) and filtered, the absorption spectra were as follows :—

TABLE 2

Case No.	Fecl <sub>3</sub> Test	Length of Cells	Log 1°/1
		C.M.	
1	±	2	1·5 λ max. 297·5 0·9 λ min. 273·0
2	±	1	0·9 λ max. 297·0 0·4 λ min. 273
3	±	2	0·9 λ max. 298·0 0·5 λ min. 274·0
4	±	2	1·2 λ max. 297·0 0·7 λ min. 273·0
5	±	2	1·2 λ max. 296·75 0·7 λ min. 270·75

2.—*Urices passed Following the Injection of Pyrocatechin Disulphonate of Soda.*

The urines were treated as before.

Urices (acid in reaction) were shaken with animal charcoal, (15 grammes per 100 c.c.) and filtered, the absorption spectra were as follows :—

TABLE 3

Case No.	Fecl <sub>3</sub> Test	Length of Cell	Log 1°/1
		C.M.	
1	±	4	0·9 λ max. 303·0 0·6 λ min. 278·5
2	±	2	1·1 λ max. 297·0 0·7 λ min. 276·0
3		4	1·4 λ max. 302·0 0·8 λ min. 277·0

*The use of pyrocatechin disulphonate of sodium as a kidney function test.*—In the previous investigations on the complex compound excreted following the injection of Fouadin, it was noticed that the urine of some of the patients gave negative results showing that they do not excrete the complex compound. When these cases were investigated as regards their kidney functions, evidence of kidney disease could be demonstrated in every one of them. This suggested that diseased kidneys are unable to excrete the complex compound as quickly as normal ones.

As Fouadin is a complex organic antimony compound containing 2 molecules of pyrocatechin disulphonate of sodium, the latter compound was also injected into patients and its excretion in the urine was followed. Here again it was demonstrated that patients with kidney disease either did not excrete the compound or only in small quantities after a certain length of time. Hence the excretion of the pyrocatechin compounds following their injection were studied together with the kidney function tests on the normal as well as on patients with distributed kidney function :—

(1) The test does not measure the rate of breaking down of the complete Fouadin molecule.

(2) The test shows various grades of disturbance which run parallel with the degree of renal dysfunction, as suggested by the completely negative results in the group of patients with very marked disturbance of the U.C.T., as well as high blood urea and X-ray findings.

(3) The test can be considered to measure the concentrating power of the kidneys.

(4) The test is valuable in detecting kidney damage in Bilharziasis in cases without clinical evidence of such damage, *e.g.* with normal blood pressure, absence of casts in the urine, etc.

(5) The investigations made show that the pyrocatechin test goes parallel with other kidney function tests. The injection of pyrocatechin disulphonate of soda can, therefore, be used with advantage to measure the concentrating power of the kidney in medical, as well as surgical affections of the urinary tract.

(Published in the Archiv für Schiffs und Tropen-Hygiene, Band 41, Nos. 11, 197, pp. 690–694.)

(c) *A quantitative study on the excretion of antimony.*—Two preparations, Fouadin and tartar emetic were used in this investigation. As the principal organ for the excretion of antimony is the kidney,



special attention is paid to ascertaining the efficiency of the kidney function tests.

A method has been evolved for the estimation of small quantities of antimony in biological material which gives an accuracy of about 90 per cent.

The excretion of antimony was followed up in two series of patients :—

*Series A.*—The excretion during the first 24 hours after a single injection.

*Series B.*—The total excretion during a course of 5 injections.

Patients with normal kidney function tests as those with distributed kidney function were included in both series. The following was found :—

(1) The first 24 hours excretion of antimony following a single injection varies in both healthy persons and in patients with disturbed kidney function tests but it is lower in the second group.

(2) The shape of the curves representing the excretion of antimony in the two groups is different.

(3) The total excretion of antimony following a course of injections does not show marked variations in the two groups of patients.

(4) No relationship is found between the volume of the urine passed and the amount of antimony excreted.

(5) When antimony excretion in the urine is interfered with, as in cases of double hydro and pyonephrosis, no compensatory increase in the antimony excretion in the faeces accurs.

*The oxidation of Fouadin in bottles with rubber caps.*—After the completion of the previous work it was found that the Fouadin used for the injection of the patients had undergone a certain degree of oxidation, the trivalent antimony being oxidized to the pentavalent form. The contents of some of the bottles examined showed that 35 per cent of antimony  $\text{Sb}^{\text{III}}$  has been changed to  $\text{Sb}^{\text{V}}$ . As to the cause of this oxidation, it was found that these Fouadin bottles were kept in store for a long time, and having rubber caps the atmospheric oxygen diffuses very slowly through the caps. Fouadin kept in sealed ampoules and stored for even longer periods was found unchanged.

As most of the previous work on the excretion of the antimony in the urine was carried out with Fouadin, it was essential that it should be repeated using Fouadin which does not contain any pentavalent antimony.

It was found that:—

(1) The shape of the curves representing the hourly excretion of antimony is the same following the injection of either Fouadin or tartar emetic.

(2) The total excretion of antimony following a course of injections does not show very marked variation in patients with normal kidney function or those with disturbed kidney function.

Fouadin is now supplied in bottles sealed in a different way to prevent the diffusion of atmospheric oxygen. Such bottles are kept up to now for eight months and showed no oxidation of their antimony content.

TABLE 4.—THE EARLY EXCRETION OF ANTIMONY AND COMPLEX COMPOUND IN THE URINE FOLLOWING THE FIRST INJECTION OF FOUADIN

Case No.	1 Hour		3 Hours	
	Fecl <sub>3</sub> Test calculated as Fouadin sb	Actual Estimation of sb	Fecl <sub>3</sub> Test calculated as Fouadin sb	Actual Estimation of sb
	MGRM.	MGRM.	MGRM.	MGRM.
1	2·2	0·5	6	1
2	4·7	1·0	10	1·6
3	2·5	0·4	16	1·4
4	4·2	0·5	5	1·0
5	Nil	Nil	Nil	Minute traces
6	10	1·1	16	1·2
7	Nil	Nil	Nil	Nil
8	4	0·4	4·2	0·5
9	Nil	Nil	Traces	0·02
10	6	0·9	8	1
11	9	1·1	11	1·4
12	Nil	Nil	4	0·6
13	1	0·08	0·8	0·16
14	Nil	Nil	Traces	0·05



TABLE 5.—THE FIRST 24 HOURS EXCRETION FOLLOWING A SINGLE INJECTION OF FOUADIN

Case No.	4 Hours		8 Hours		12 Hours		12-24 Hours	
	Fecl <sub>3</sub> Test calcu- lated as Fouadin sb	Actual Estima- tion of sb	Fecl <sub>3</sub> Test calcu- lated as Fouadin sb	Actual Estima- tion of sb	Fecl <sub>3</sub> Test calcu- lated as Fouadin sb	Actual Estima- tion of sb	Fecl <sub>3</sub> Test calcu- lated as Fouadin sb	Actual Estima- tion of sb
	MGRM.	MGRM.	MGRM.	MGRM.	MGRM.	MGRM.	MGRM.	MGRM.
1	about 2	0·4	6	1·1	10	1·1	15	2
2	21	3·1	6	2·5	Traces	1·5	Nil	2·4
3	20	4	8	1·0	Nil	1·0	Nil	1·5
4	30	3·5	6	1·75	Traces	0·75	Nil	1·3
5	49	6	18	2·8	Nil	1·2	Nil	3·6
6	6	0·8	9	0·9	6	0·8	12	1·7

## SECTION II.—Report of the Section Clinical Investigation

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### INVESTIGATIONS ON ANAEMIAS

(1) *Mechanism of Fe action in cases of hypochronic anaemia* is not yet entirely solved. Whether it acts as substitution therapy for Hb. deficiency, whether it stimulates the bone-marrow primarily or, whether it combines the two actions, is the subject of an investigation carried out in the course of this year.

Following the administration of Fe in these cases, 2 phenomena occur: (1) rise of Hb. (2) increase of ret. (ret. crisis) suggesting stimulation of erythropoiesis.

In a series of experiments along these lines, the following observations were made:—

- (a) Minimal doses of Fe stimulated the bone-marrow and resulted in a ret. rise, but were not sufficient to produce increase of the Hb.
- (b) Different quantities of Fe may result in similar degrees of reticul. rise but in different degrees of Hb. increase. Although the rise in Hb. is in proportion to the doses of iron administered, it is not related to the increase in ret.

This suggests that the Hb. rise should be taken as the criterion of response to Fe therapy in these anaemias. As to the nature of the ret. crisis and its relation to Hb. construction, further investigations are being made.

(2) *Hb. reg. in hypochronic anaemia*.—Based on the view, arrived at from the previously outlined investigations, that Hb. reg. is the criterion of response to Fe therapy, the effect on the Hb. reg., within a constant period, of various factors, *e.g.* age, sex, etc., in cases of ancylostoma anaemia was studied. The results obtained are outlined in the clinical report and are given in detail in a paper which is under publication.

(3) *Acholuric jaundice*.—A detailed study, hæm., clinical and pathological (of removed spleens) was carried out on a mother and her two daughters who were found to suffer from familial achol. jaundice. These cases represent the first authenticated report of this condition in Egypt as well as the first cases splenectomised for this condition in this country.

The histology of the spleen in achol. jaundice was described and the points of differentiation from the picture found in Bil. hepatolienal fibrosis are outlined.



Another type of hæmol. jaundice and anaemia was found (2 cases) and identified as acquired hæm. jaundice of Widal Hayems type.

Some data on these cases are given in the clinical report, while a detailed account was published. (The Journal of Egyptian Medical Association, XIX, No. 5, 1936.)

(4) *Achlorhydria and anaemia*.—The relation of these two conditions was studied in a series of cases with the conclusion that not only is achlorhydria of aetiological importance in the causation of anaemia, but that the anaemic state can also be responsible for the occurrence of achlorhydria. In this latter case a vicious circle develops the anaemia producing achlor. and the achlor. in turn aggravating the anaemia.

The anaemia Hll. reappeared in the vicious circle was broken in our cases. (See clinical report.)

(5) *Demonstration of the intrin. haemopoietic principle (castle) in ancylostoma anaemia*.—Despite the enormous number of cases of ancylostoma anaemia seen in the course of years in the Research Inst., not a single case with macrocytic blood picture, megaloblastic bone-marrow and response to liver therapy has ever been found, although this anaemia is not seldom associated with achlorhydria.

In addition to this observation it was attempted to demonstrate experimentally the hæm. intr. principle in the gastric secretion of these cases.

Two cases with achlorhydria were chosen (1 positive and 1 negative after hist.), the gastric juice was collected from the fasting, washed stomach after hist. The secretion obtained in this way was injected into two white rats made anaemic by milk diet during a period of a week, *i.e.* until they showed constant low ret. counts. The results of this experiment showed that the gastric secretions of these two cases were capable of producing ret. crisis in these rats, *i.e.* a positive R.R.R. According to Singer this proves the presence of intr. hæm. principle in these cases.

These hæm. and experimental data suggest that ancyl. infection does not interfere with either the formation or the absorption of the hæm. principle as is possibly the case in *dibothriocephalus latus* infection.

#### HEPATOSPLENOMEGALY

Following the scheme for investigating cases of splenomegaly in Egypt outlined in the previous report and publication, it was found that the majority of cases showed multiplicity of causal factors making the study of pure cases difficult.

Nevertheless up till now the following conditions were found to be responsible for splenomegaly in Egypt:—

1. Bilh. H.L. Fibrosis.
2. Chronic malarial splenomegaly and hepatosplenomegaly.
3. Syphilitic H.L. Fibrosis and syphilitic reticulosis.
4. Splenic vein thrombosis.
5. Toxic cirrhosis (sub-acute yellow atrophy) with splenomegaly.
6. Leukæmias, myelosis and lymphadenosis.
7. Sub-leukæmic reticulosis.
8. Acholuric jaundice, familial and acquired.
9. Hodgkin's disease.
10. Chronic catarrhal jaundice with splenomegaly.
11. Chronic infective cholangitis with splenomegaly (biliary cirrhosis).
12. Simple achlorhydric anaemia.
13. Ancylostoma anaemia in children.
14. Von Jaksch's anaemia.
15. Cooley's erythroblastic anaemia.
16. Addisonian anaemia.
17. Endocarditis lenta.
18. Albers Schonberg's disease.
19. Sub-miliary tuberculosis with hepatosplenomegaly.
20. Amyloid spleen.

It can be seen that the commonest causes of splenomegaly in Egypt are according to frequency:—

1. Bilharziasis.
2. Malaria.
3. Syphilis.
4. Hæmopoetic disease.

The diagnostic criteria of each of these is discussed in the clinical report; the other rare forms will be described when sufficient data are available.



## MALARIA

### *Diagnosis of Malarial Hepatosplenomegaly.*

In addition to defining the clinical differentiating points of this condition from Bilharzial H.L. Fibrosis which it simulates markedly in the hepatosplenomegalic stage, certain methods of investigation were tried during this year in this connection and have given promising results :—

(1) *Sternal puncture*.—Material obtained from the bone-marrow of the sternum by the method previously published was studied in cases of malarial hepatosplenomegaly and compared with that from cases of Bilh. H.L. Fibrosis ; the following findings were met with :—

- (a) Malarial pigment could be demonstrated in some cases ; no pigment was found in cases of pure Bilh. H.L. Fibrosis.
- (b) Malarial parasites could only be found in the bone-marrow when they could be demonstrated in the peripheral blood.
- (c) Definite increase of the reticulum cells of the bone-marrow was found in the majority of cases of malaria hepatosplenomegaly. This finding suggests their genetic relation to the monocytes.
- (d) An eosinophilic reaction of the bone-marrow with the presence of eosinophilic myelocytes is present in the majority of cases of Bilh. H.L. Fibrosis.
- (e) The nature of erythropoiesis is different in the two conditions ; while it is mainly normoblastic in Bilh. H.L. Fibrosis, it is usually erythroblastic (mainly macroblastic) in malarial hepatosplenomegaly.

(2) *Quinine reticulocytic crisis*.—The administration of quinine to cases of malarial hepatosplenomegaly was found to be followed by an increase in the reticulocytic count about the third to the fifth day. Similar results were obtained from the administration of Atebrin. This procedure was not followed by any increase in the reticulocytes in cases of Bilh. hepatosplenomegaly.

(3) *The Takata-Ara reaction* applied to blood serum was found to be negative in cases of malarial hepatosplenomegaly without parasites ; while it is usually positive in well-developed cases of Bilh. H.L. Fibrosis. A positive test is considered as an evidence of the presence of cirrhosis ; accordingly these findings suggest the absence of cirrhotic changes in malarial hepatosplenomegaly.

## BLACK WATER FEVER VERSUS PLASMOCHINE POISONING

In a previous report, (Report of the Research Institute, 1934) three cases were described under the heading of Black Water Fever in which the possibility of plasmochine poisoning could not be absolutely excluded. A fourth case was met with during this year in a malarial boy in Gabal El-Asfar, who was also receiving plasmochine in appropriate dosage. These cases are all characterised by the presence of severe hæmolytic crisis, resulting in marked reduction in hæmoglobin and R.B.Cs., marked reticulocytosis, hyper-bilirubinæmia, methæmoglobinæmia and methæmoglobinuria. Oxy-hæmoglobin could not be easily demonstrated in the presence of methæmoglobin. Moreover methæmoglobinæmia, although constant in black water fever, is certainly more marked in such cases receiving plasmochine.

Similar cases are reported in the literature, some of them are ascribed to black water fever, others to plasmochine poisoning. In our four cases, plasmochine was taken in small doses which cannot produce poisoning, but the question of individual idiosyncrasy to the drug could not be neglected. To investigate this point one of our cases after recovery from the acute attack was given again plasmochine in the same daily doses and for the same period, improvement continued and no recurrence of hæmolysis or methæmoglobinæmia occurred. This experiment excludes the possibility of idiosyncrasy.

Whether hæmolysis occurs in cases of plasmochine poisoning or not, could not be learned from the literature. Accordingly experiments on dogs were carried out to decide on this point. 6 dogs were given plasmochine in two doses, single and repeated by injection, the R.B.C. counts, fragility, reticulocytes and interus index were followed till the time of death. The results obtained showed that plasmochine does not possess any hæmolytic action.

## SECTION III.— Helminthology

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### SCHISTOSOMIASIS

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#### A.—Epidemiology

#### *An Epidemic-like Increase of Mortality due to Intestinal Schistosomiasis in an Egyptian Village.*

Tanan is a small village lying about 25 kilometres to the north-east of Cairo. There are 1,550 houses occupying an area of 60 acres housing about 9,000 souls.



Towards the close of 1934, there was unexplained increase in the mortality rate among adult males. This subsided in the beginning of next year to reappear in October, November and December of 1935.

Most of the patients seen were young adults complaining of dysentery, ranging from acute conditions to mild cases of diarrhoea. In both conditions the patients were extremely debilitated and anæmic. Pellagric rashes were seen on the face and leg. Hæmoglobin values ranged from 6 to 30 per cent, and the differential count showed eosinophils, ranging from 6 to 30 per cent. At this period no malarial parasites were met with and microfilaria were demonstrated in 8 per cent of the cases, although no clinical manifestations were observed in the patients examined. The spleen and liver were enlarged in 5 per cent of the cases. The enlargement not exceeding 2 fingers.

Death unusually followed after a period of illness, varying from few months to two years.

Graphs 1 and 2 show the mortality rate among the population during 1934 and 1935. The high infant mortality was attributed to infantile diarrhoea and enteritis.

Graph 3 shows the mortality among male adults in both years and marks the definite increase in the death rates at the same time.

Map 1 shows the distribution of the deaths according to the houses and their concentration on the eastern part of the village.

Graphs 4, 5, and 6 show the rate of incidence of infection with the important parasites among the population of this village according to age and sex.

#### *Schistosoma Hæmatobium Infection.*

Out of the number examined (396), 55 per cent were infected with Schist. hæm.; 86 per cent of the males were infected, while only 24 per cent of the females had the infection. In the stools it was 11 per cent of the total number examined.

In the western part of the village the infection was more marked than in the eastern part where there were no big canals harbouring the bulinus.

#### *Schistosoma mansoni Infection.*

This was 59 per cent of the cases examined. In the males it was 61 per cent, while it was 31 per cent in the females. 3 per cent of the total number examined had the ova in the urine.

#### *The Relation of Bilharzial Infection to Agricultural Work.*

Graph 7 shows the rate and distribution of infection among the population according to their professions. In the farmers of the



eastern part the rate of infection was higher in the case of Schist. hæm. than in those of the west. The symptoms were more marked in the labourers of the east than those of the west in whom no derangement was observed.

### *The Relation of Infection to Age and Sex.*

Graph 8 shows the difference between the two types of infection among males and females. S. M. infection tends to rise as age advances, reaching its maximum in adults from 11 to 40, after this it begins to decrease, whereas in Schist. hæm. no definite relation to sex could be observed.

### *Irrigation Canals.*

Water for irrigation is drawn from the Seesa canal, branching from the Nile at Shubra. The main branch lies 500 metres to the west of the village. It passes north, branches into two, the bigger of which passes through the village. As it goes out, it runs to the east and meets a branch coming from Mazhar canal, which branches from the Seesa canal also about 2 kilometres to the south of the village. Examination of the canal passing through the village, revealed that its course was almost blocked with refuse and carcasses of dogs. The water was stagnant and the surface was covered with algæ. The banks of the canal were irregular and the flow of the water was markedly impeded.

Bulinus snails were found throughout the course of the stream. Physa acuta, Planorbis boissyi and Lanistes boltini were met with in large numbers in the canal after it has left the village. No mature cercariæ were seen at the time of examination, but dissection showed developmental stages of Bilharzia in some of the snails on 70 per cent of the snails collected from this locality which showed cercariæ.

### *The Source of Infection of the Snails.*

Investigation has shown that the sewer of the mosque, lying in the vicinity of the canal, opened right into it. As the latrines of the mosque are usually used by the inhabitants of this part, we can easily realise the great danger to public health.

The water from the ablution helps to hatch the ova of Bilharzia, the miracidia of which pass to the canal to find the intermediate host among the large number of Planorbis snails present.

The development, completed in about 4 weeks, ends in the liberation of large numbers of cercariæ which pass down the stream and attack the people irrigating the land on either side.



*Facts in Favour of Intestinal Bilharziasis as the Cause of the Increase in Mortality.*

(1) All the patients examined were suffering from severe intestinal Bilharzia and complained of chronic diarrhoea which ended fatally in some cases.

(2) Autopsy showed no reason for death other than severe generalised Bilharzial invasion of the abdominal organs and lungs.

(3) The high incidence of the intestinal Schistosomiasis in the inhabitants of the eastern part of the village together with the peculiar age incidence among adult from 11 to 40, especially field workers corresponds with the increased death-rate among this group. The reason of high mortality during the later months of the year could be attributed to the fact that the infection usually takes place in the summer months, from May to August, when the output of cercariæ reaches its maximum.

(4) The non-contagious nature of the disease was shown by the incidence of mortality in one class, *i.e.* adult males only, whereas females and children living under the same conditions were free. One would expect no discrimination between the categories of the population.

*Prevention and Treatment.*

As the economical conditions of the people do not allow them to travel for treatment, it was found essential to send a Bilharzia and Ancylostoma Travelling Unit to settle there and treat all the infected persons.

*Eradication of the Snail Carriers.*

It is a well-known fact that *Planorbis boissyi* lives and thrives in small canals with very slow current. It has been thought necessary to abolish the stream passing through the village, in order to avoid its gross pollution. A scheme shown in Map 2 has been suggested. The new canal has to fulfil the following conditions :—

(1) It has to irrigate the land previously served by the old canal.

(2) It should lie at a considerable distance from the village to insure its cleanliness.

(3) A constant flow of water is to be established and the absence of dead ends should be taken into consideration. This would be guaranteed by the difference in the level of water between the intake from the Seesa canal and the outlet at Mazhar canal. This was found to be 67 centimetres and is quite sufficient to develop a good



flow of water in the new canal and to prevent the snails from settling and breeding.

Palliative measures have to be applied until the new scheme is completed. These are :—

- (a) Cleaning and deepening the canal by removing the mud and weeds from the bottom and sides. This will create a good current and washes off the remaining snails.
- (b) The permanent closure of the latrines of the mosque. The drain of the mosque has to be removed, so as to restrict the chances of infecting the snails which may survive the former measures.

### B.—*Prevention*

A visit to the village Rashda (Dakhla Oasis) was made in February 1936 to re-examine the population for urinary Schistosomiasis and to report on the snail fauna of the locality, in order to see if there were any *Bilharzia* carriers in the streams of the village.

Previous measures in the form of treating the streams with four parts per million of copper sulphate and filling up the stream harbouring the snails, were taken in 1930; the population were treated in 1926 and 1928.

For the examination, the population is divided into three categories :—

(1) Out of the persons treated twice with tartar emetic in 1926 and 1928, sixty were examined and twenty-six showed the ova in their urines (41 per cent). This high proportion was due to both relapses and to reinfection during the period from 1928 to 1930.

(2) Out of those treated once only two hundred and twenty were examined and fifty-eight were positive (26 per cent).

(3) Out of seventy children born after 1930, the date in which the preventive measures were taken, none showed any ova in the urine, although they frequented all the streams for bathing.

(4) Traps in the form of banana and palm-leaves were introduced into all the streams of the village to catch their snails. Examination revealed only *Melania tuberculata* in most of the streams and *Limnea* sp. in one stream only. *Bulinus* was completely absent in all the streams of the village. The result of this examination confirmed the findings of the urinary investigation of the children born in 1930, and shows the success of the measures which were taken in this isolated locality. It is remarkable that both the treatment of the population and the eradication of the snail carriers have improved the general health and working capacity of the inhabitants in such manner, that



the area of cultivable land has increased 25 per cent. It is also noteworthy that the symptoms of the disease in the still positive cases have become much milder and the pathological complications of *Bilharzia* are entirely absent.

C.—*Experimental Schistosomiasis*

(This work is still conducted on various animals.)

*Trematode Infection among Egyptian Snails.*

During the survey of the Egyptian larval trematodes, I came across *Limnea caillaudi* collected from an agricultural drain in the vicinity of Abu Zaabal Prison. This drain was constantly frequented by sheep and goats. Considerable amounts of their excreta were observed among the weeds and plants on either side of the canal.

*Together with the snails.*—Out of 20 full grown specimens of *Limnea*, 5 liberated many gymnocephalus cercariæ identical in morphology with *F. hepatica*.

They were 2.48 millimetres in length, the body being 68 millimetres, 56 millimetres. The tail fully extended measured 1.8 millimetres in length. The oral sucker was 90 in diameter, leading down to a muscular pharynx and a short œsophagus bifurcating in two intestinal ceca, reaching the posterior border of the body. The ventral sucker is also 90 in diameter.

The parenchyma of the body is occupied with cystogenous gland obscuring the finer details of the excretory system.

When the infected snails were put in a beaker containing water and aquatic plants, the cercariæ swam actively for a short time. Afterwards they crawled on the sides of the vessel or on the stem and leaves of the plants in order to encyst. The body of the cercaria became rounded up, and a thick gelatinous secretion was exuded, separating it from the tail. The wall of the cyst consisted of two layers. The inner was dark brownish in colour and the outer was clear. The diameter of the cysts varied from 340 to 360  $\mu$ . They retained their vitality for a period of 10 days, provided that they were kept moist. No further metamorphosis was observed inside the cysts. The metacercariæ becoming infective, directly they reached the final hosts. (Figs. 1, 2 and 3, Pl. I).

Direct feeding experiments were carried out on rabbits. The first received 20 cysts given by mouth. 50 days later, it died. Autopsy revealed severe hæmorrhages in the peritoneal cavity due to rupture of the liver capsule. This organ was enlarged and showed greyish white patches on the surface. Two immature flukes were squeezed out of the liver and two others were found free in the peritoneal cavity. Each worm measured 15 millimetres in length by 4 millimetres in breadth.



The second rabbit died 58 days after receiving the same number of cysts. On autopsy, the liver showed the same picture as that seen in the first one, but the capsule was intact.

The anatomy of the worms collected, showed that they belonged to the genus *Fasciola*.

The final evidence was brought by the infection of the limnea snails with miracidia from eggs of *Fasciola* collected from the Cairo abattoir. The snails were brought from the Institute's snail aquaria and were known to be free from previous infection.

The miracidia were observed to penetrate readily into the snails. Dissection at intervals varying from 20 to 40 days showed that the rediae started to appear on the 24th day. The development was complete on the 35th day when free cercariæ were liberated.

*Limnea caillaudi* snails are very frequent in Lower Egypt and in the northern part of Upper Egypt as far south as Girga, where the land is under perennial irrigation. In Qena and Aswan Provinces, most of the land is under basin irrigation, and the dry hot climate of these parts does not favour the breeding of these snails.

They prefer water streams with a moderately rapid current and a lot of vegetation. They may live in fresh water basins and ponds if the water could be changed from time to time. (Figs. 4 and 5, Pl. II).

*Observations on the Incidence of Ancylostmiasis in Kalalsa, Qena Province.*

Kalalsa is a small village lying in the midst of a vast area under basin irrigation. It consists of two parts, separated by two main canals. The eastern part houses the better class of the population, while the western part is inhabited by the poorer classes consisting of farmers and poor labourers. In both parts, the houses were devoid of latrines.

Among 100 persons examined from the eastern part, 47 showed infection with *Ancylostoma deuodenale*, whereas in the western part 93 per cent were positive. Anaemia was less marked in the former cases than in the latter, and deaths were reported from one family, all the members of which suffered markedly from heavy infection with the parasite.

TABLE 6.—THE RELATION OF THE PERCENTAGE OF HÆMOGLOBIN TO THE NUMBER OF OVA

Case No.	Number of Ova	Percentage of Hæmoglobin
		%
1	5,790	60
2	1,990	50
3	2,190	50
4	15,600	40
5	8,400	20
6	3,300	20



The degree of anæmia does not follow the number of worms. It was also observed that the nutrition and kind of food used have great bearing on the condition of the subject. The degree of easinophilia is more intimately related to the condition of the patient than to the number of worms.

The western part is two metres lower in altitude than the eastern part. Both parts are higher in altitude than the highest level attained by the Nile water during the flood.

As there are three ponds in the district, formed after the inundation of the land with water, they cannot be due to high subsoil water. During this period, the soil is highly saturated with moisture and is very favourable for the growth and development of *Ancylostoma* larvæ. This, however, was proved by the presence of these stages in all the specimens of the soil examined.

#### *Prevention.*

(1) The construction of bore-latrines in all the houses of the village and the mosques with the necessary regulations and instructions.

(2) Mass-treatment of all the population.

It is a well-known fact that there is a spontaneous reduction of 12 per cent of the total number of the worm burden. The first treatment removes 85 to 95 per cent of the remaining parasites. Thus, it would be advisable in this case to apply mass-treatment by giving carbon tetrachloride to all the suitable cases. The best season for carrying out this campaign is from June to August, when the people are free from labour and could attend the hospital without delay. If this procedure is followed twice within one month, a remarkable reduction of the number of the larvæ in the soil would ensue and the chance of reinfection would be remote.

It is interesting to note that, in this locality, the incidence of *ascaris* is 3 per cent, and that of *Schistosoma hæmatobium* in the urine is only 2 per cent.

#### SECTION IV.—Medical Entomology

The work carried out in this section falls under the following headings :—

(1) Identification of insects sent to the Research Institute.

(2) Supervision of the work of the Khanka Malaria Research Station.

(3) Field work. Malaria Survey at Kafr Ghataty and Edfina.

(4) Research problems.

# I.—IDENTIFICATION OF INSECTS SENT TO THE RESEARCH INSTITUTE

*Mosquito larvæ*.—During 1936, 3,053 samples of water containing mosquito larvæ were sent to the Research Institute for identification.

The samples were sent from the following places:—

	Samples
1. Cairo Health Inspectorate ... ..	283
2. Municipality of Alexandria ... ..	12
3. Gharbiya Province ... ..	516
4. Sharqiya Province ... ..	500
5. Kalioubieh Province ... ..	506
6. Beheira Province ... ..	153
7. Dakahlieh Province ... ..	96
8. Menufiya Province ... ..	48
9. Giza Province ... ..	109
10. Fayum Province ... ..	738
11. Beni Suef Province ... ..	3
12. Qena Province ... ..	1
13. Aswan ... ..	88
TOTAL ... ..	<u>3,053</u>

The locality distribution of the mosquito larvæ found in the samples of the water sent from the Provinces is shown in the following table :—

TABLE 7

Species	Kalioubieh	Gharbiya	Sharqia	Beheira	Dakahlieh	Menufiya	Giza	Fayum	Aswan	Total
Anopheles multicolor ...	17	41	56	15	7	1	—	158	49	344
Anopheles pharoensis ...	69	56	87	13	8	1	5	16	9	264
Anopheles sergenti ...	—	—	17	—	—	—	—	74	—	91
Anopheles mauritanus...	6	1	28	6	—	2	1	2	—	46
Aedes caspius ... ..	49	62	135	34	10	2	16	119	11	438
Uranotænia unguiculata	5	6	71	8	1	—	—	18	—	109
Theobaldia longiareolata	6	2	2	—	—	—	1	3	2	16
Aedes aegypti ... ..	—	1	—	—	—	—	11	—	—	12
Culex pipiens ... ..	307	126	71	26	16	22	58	122	18	766
Culex perexiguus ... ..	111	76	52	28	16	9	18	103	10	423
Culex laurenti ... ..	54	106	102	28	9	11	8	64	2	384
Culex pusillus ... ..	6	20	14	2	4	—	—	24	4	74
Culex quasigelidus ...	1	8	6	1	—	—	—	3	—	19
Culex laticinctus ... ..	—	4	—	—	—	—	2	1	—	7



The monthly distribution of the various species of mosquito larvæ sent by the Cairo City Health Inspectorate is given in the following table :—

TABLE 8

Species	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anopheles pharoensis ...	—	—	4	—	1	2	1	—	9	2	4	2	25
Anopheles multicolor ...	—	—	3	8	—	3	1	—	—	1	1	—	17
Theobaldia longiareolata	—	1	—	2	10	5	2	1	—	1	2	1	25
Uranotænia unguiculata	—	—	—	—	—	—	—	—	—	—	1	—	1
Aedes caspius ... ..	—	4	2	2	—	5	1	5	6	9	11	—	45
Aedes aegypti ... ..	—	2	8	—	—	2	—	—	3	6	2	—	23
Culex pipiens ... ..	2	2	5	7	13	7	1	5	16	26	11	4	99
Culex perexiguus ... ..	—	1	—	—	1	5	2	6	39	16	5	—	75
Culex laticinctus ... ..	—	—	1	—	—	4	2	1	5	7	8	2	30
Culex laurenti ... ..	—	—	2	—	—	2	—	—	1	1	3	1	10
Culex pusillus ... ..	—	1	—	—	—	—	1	—	2	2	—	—	6
Culex tipuliformis ...	—	—	—	—	—	1	—	—	—	—	—	—	1

The twelve water samples sent from the municipality of Alexandria contained the following species :—

	Specimens
Anopheles mauritanus ... ..	3
Anopheles pharoensis ... ..	1
Anopheles multicolor ... ..	1
Aedes caspius ... ..	3
Uranotænia unguiculata ... ..	1
Culex pipiens ... ..	1

The following table gives the monthly distribution of the species of mosquito larvæ sent from Gharbiya Province :—

TABLE 9

Species	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anopheles pharoensis ...	—	—	—	—	—	—	1	2	10	19	20	4	56
Anopheles multicolor ...	—	—	1	—	—	—	—	—	1	9	25	5	41
Anopheles mauritanus...	—	—	1	—	—	—	—	—	—	—	—	—	—
Aedes caspius ... ..	—	1	—	—	1	2	—	1	—	10	26	21	62
Uranotænia unguiculata	—	—	—	—	—	—	—	—	—	—	2	4	6
Theobaldia longiareolata	—	—	—	—	2	—	—	—	—	—	—	—	2
Aedes aegypti ... ..	—	—	—	—	—	1	—	—	—	—	—	—	1
Culex pipiens ... ..	1	8	1	—	5	4	2	—	—	26	29	50	126
Culex laurenti ... ..	—	—	—	—	—	2	—	1	10	11	66	16	106
Culex perexiguus ... ..	—	—	—	—	—	1	2	1	10	23	30	9	76
Culex pusillus ... ..	—	—	—	—	—	—	1	—	1	4	10	4	20
Culex quasigelidus ...	—	—	—	—	—	—	1	—	—	1	5	2	8
Culex laticinctus ... ..	—	—	—	—	—	—	1	—	—	2	1	—	4

The following table gives the monthly distribution of the various species of mosquito larvæ sent from Kalioubieh Province :—

TABLE 10

[illegible]



The following table gives the monthly distribution of the various species of mosquito larvæ sent from Beheira Province :—

TABLE 11

Species	January	February	March	April	May	June	July	August	Septe	October	November	December	Total
Anopheles multicolor ...	—	—	—	—	—	—	7	—	3	3	2	—	15
Anopheles pharoensis ...	—	—	—	—	—	—	—	—	—	1	4	8	13
Anopheles mauritanus	—	—	—	—	—	—	—	—	—	—	2	4	6
Aedes caspius ... ..	1	—	—	—	—	5	7	—	1	2	8	11	34
Uranotænia unguiculata	—	—	—	—	—	—	—	—	—	—	4	4	8
Culex perexiguus ...	—	—	—	—	—	2	3	—	1	10	9	3	28
Culex laurenti ... ..	—	—	—	—	—	—	1	—	2	5	9	11	28
Culex pipiens ... ..	1	—	—	1	—	1	—	—	—	10	9	4	24
Culex pusillus ... ..	—	—	—	—	—	—	—	—	—	—	2	—	2
Culex quasigelidus ...	—	—	—	—	—	—	—	—	—	1	—	—	1

The following table gives the monthly distribution of the various species of mosquito larvæ sent from Sharqiya Province :—

TABLE 12

Species	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anopheles pharoensis ...	19	—	—	—	—	3	1	1	—	—	9	54	87
Anopheles multicolor ...	4	—	2	14	1	2	—	1	—	6	8	18	56
Anopheles mauritanus...	11	2	4	3	—	—	—	3	—	—	—	5	28
Anopheles sergenti ...	8	2	1	—	—	—	—	1	—	—	1	4	17
Aedes caspius ... ..	20	10	—	11	—	1	—	2	—	6	31	54	135
Uranotænia unguiculata	3	—	—	1	—	—	—	—	—	—	10	58	71
Theobaldia longiareolata	—	—	—	—	—	—	—	—	1	—	1	—	2
Culex laurenti ... ..	21	1	3	1	—	1	1	1	—	3	11	59	102
Culex pipiens ... ..	7	8	1	4	1	5	—	—	1	5	15	29	71
Culex perexiguus ... ..	2	5	2	6	—	1	—	4	—	4	12	12	52
Culex pusillus ... ..	6	1	1	—	—	—	—	—	—	—	—	5	14
Culex quasigelidus ...	2	—	—	—	—	—	—	—	—	—	1	3	6

The following table gives the monthly distribution of the species of mosquito larvæ sent from Dakahlieh and Menufiya Provinces. In Dakahlieh no specimens were sent before August and in Menufiya no specimens were sent before October :—

TABLE 13

Daqahliya							Menufiya				
Species	August	September	October	November	December	Total	Species	October	November	December	Total
Aopheles pharoensis	2	3	—	2	1	8	Anopheles mauritanus	—	2	—	2
Aopheles multicolor	—	—	—	7	—	7	A. pharoensis	—	1	—	1
Aedes caspius	1	—	—	9	—	10	A. multicolor	—	1	—	1
Uranotænia unguiculata	—	—	1	—	—	1	Aedes caspius	—	1	—	1
Culex pipiens	2	—	3	7	4	16	Culex pipiens	—	22	—	22
Culex pere-xiguus ...	3	1	6	6	—	16	Culex pere-xiguus ...	1	10	—	11
Culex laurenti	2	2	—	3	2	9	Culex laurenti	—	9	—	9
Culex pusillus	3	—	1	—	—	4					

The following table gives the monthly distribution of the species of mosquito larvæ sent from Giza Province :—

TABLE 14

Species	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anopheles pharoensis ...	—	—	—	—	—	3	—	—	2	—	—	—	5
Anopheles mauritanus...	—	—	—	—	—	1	—	—	—	—	—	—	1
Aedes caspius ... ..	2	1	2	—	1	2	1	3	1	2	1	—	16
Aedes aegypti ... ..	—	—	—	—	—	9	1	—	1	—	—	—	11
Theobaldia longiareolata	—	—	—	—	—	1	—	—	—	—	—	—	1
Culex pipiens... ..	6	10	5	3	—	12	6	2	2	8	4	—	58
Culex perexiguus ... ..	—	1	—	1	—	—	4	6	5	1	—	—	18
Culex laurenti ... ..	—	—	—	—	1	5	—	—	—	2	—	—	8
Culex laticinctus ... ..	—	—	—	—	—	—	2	—	—	—	—	—	2



The following table gives the monthly distribution of the various species of mosquito larvæ sent from Fayum Province :—

TABLE 15

Species	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anopheles multicolor ...	15	14	23	8	3	12	1	7	12	15	12	36	158
Anopheles sergenti ...	5	2	1	—	—	1	2	4	9	4	28	18	74
Anopheles pharoensis ...	2	1	—	—	—	1	—	2	1	1	1	7	16
Anopheles mauritanus	—	—	—	—	—	—	—	—	1	—	—	1	2
Aedes caspius ... ..	5	4	14	4	13	12	2	4	16	8	7	30	119
Uranotænia unguiculata	1	2	—	—	—	—	—	—	—	—	10	5	18
Theobaldia lengiareolata	2	—	—	—	—	1	—	—	—	—	—	—	3
Culex pipiens... ..	22	9	15	10	5	6	—	9	2	3	9	32	122
Culex perexiguus ... ..	5	5	5	2	12	10	7	21	4	10	9	13	103
Culex laurenti ... ..	8	2	11	3	1	1	1	—	1	3	17	16	64
Culex pusillus ... ..	2	2	1	1	—	2	—	3	1	3	2	7	24
Culex quasigelidus ...	—	—	—	—	—	—	—	—	—	—	—	3	3
Culex laticinctus ... ..	1	—	—	—	—	—	—	—	—	—	—	—	1

The following table gives the monthly distribution of the species of mosquito larvæ sent from Aswan Province :—

TABLE 16

Species	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anopheles multicolor ...	3	3	3	—	—	—	—	—	2	9	22	7	49
Anopheles pharoensis ...	—	—	—	—	—	—	—	—	4	1	4	—	9
Aedes caspius ... ..	—	1	7	—	—	—	—	—	2	—	1	—	11
Theobaldia longiareolata	—	—	—	—	—	—	—	—	—	—	2	—	2
Culex pipiens ... ..	—	4	11	—	—	—	—	—	—	—	2	1	18
Culex perexiguus ... ..	—	—	1	—	—	—	—	—	—	5	4	—	10
Culex pusillus ... ..	—	—	—	—	—	—	—	—	—	—	3	1	4
Culex laurenti ... ..	—	—	—	—	—	—	—	—	—	—	2	—	2

The water sample sent from Qena contained larvæ of culex pipiens.

## II.—SUPERVISION OF THE WORK OF THE KHANKA MALARIA RESEARCH STATION

The work carried out in the station includes : (1) Field Work.  
(2) Work carried out inside the station.

### I.—*Field Work.*

A complete description of the area controlled by the Khanka Malaria Research Station is given in the fourth annual report of the Research Institute and Endemic Disease Hospital.

The mosquito larvæ survey of the area revealed the presence of the following species:—

*Anopheles pharoensis.*

*Anopheles multicolor.*

*Anopheles mauritanus.*

*Anopheles sergenti.*

*Aedes caspius.*

*Theobaldia longiareolata.*

*Uranotaenia unguiculata.*

*Culex perexiguus.*

*Culex pipiens.*

*Culex laurenti.*

*Culex pusillus.*

*Culex laticinctus.*

It will be noticed that *anopheles sergenti* was for the first time found breeding in a swamp covered with tall reeds, and situated to the north-east beyond the end of Gabal El-Asfar drain. As a result of previous surveys carried out in Fayum, this mosquito has been suspected to be a malaria vector on epidemiological evidence.

During the epidemic of malaria at Gabal El-Asfar farm, special attention was paid to drain this swamp as quickly as possible by extending Gabal El-Asfar drain to the east.

Another feature of interest is the change of the anopheline fauna, which occurred in the swamp situated to the north of El-Birka village. Previously this area was notorious as a breeding-place of *anopheles multicolor*, since this land was salty and not under cultivation. With the erection of El-Alag pump, the water level was reduced by 1·80 metres and the swamp was dried. Rice was cultivated in the dried swamp to wash out the salt of the land. This had its effect on changing the fauna of the land from a predominance of *anopheles multicolor* larvæ into a predominance of *anopheles pharoensis* larvæ.



The same effect was noticed in a swamp situated to the north-west of Gabal El-Asfar farm. A plot of the marsh was drained, and rice was cultivated. In consequence *anopheles pharoensis* larvæ began to replace *anopheles multicolor*.

*Anti-mosquito Measures :—*

Filling and draining of breeding areas.

Cutting of weeds and vegetation.

Larvicides.

Fish control.

*Filling.*

- (a) A birka, facing Abu Zaabal Prison on the eastern bank of Ismailia canal was filled in by the labour corps of the Khanka Station. The area filled is about 15 feddans and the cost of filling was L.E. 270.

The value of the reclaimed land is about L.E. 400.

Thus, in this case, the cost of filling is more than compensated by the value of the reclaimed land.

- (b) Filling of Birket El-Souq in Abu Zaabal Village. The area filled in is 6,232 square metres and the cost of filling is L.E. 127. The value of the filled land exceeds the amount of money spent since this land could be used for the future extension of the village.

*Drainage works.*

The Public Works Ministry at the request of the station, undertook the completion of the following schemes :—

- (a) Erection of El-Alag pump at kilo 60.450 on the Belbeis drain. The effect of this was to drain a swamp area about 5,000 feddans. This area is now mostly cultivated.
- (b) Extension of the Belbeis drain, 1 kilometre towards El-Birka village and enlarging its bed. By this means the area was dried and cultivated.
- (c) Extension of Gabal El-Asfar drain to the east. By this means the adjoining swamps which used to breed *anopheles sergenti* were dried.

*Cutting of weeds. and vegetation.*

Owing to the epidemic of malaria at Gabal El-Asfar farm, a permanent gang was appointed to clear the drain of the farm.

*Paris green.*—About 20 kilogrammes of Paris green were used in 1936. The mixture used was 1 part Paris green to 100 parts of oven dust. Assuming that 10 grammes of the mixture were used for every square metre, the area dusted would be 200,000 metres.

*Oiling.*—In 1936 the station adopted the plan of oiling more extensively than in previous years. About 25 grammes of mazout oil were found sufficient to kill both culicine and anopheline larvæ found in a square metre. The amount of mazout oil used is 16,600 kilogrammes. On this basis about 664,000 square metres were sprayed.

*Fish stocking.*—Breeding of *Gambusia* was carried in numerous wells and borrow-pits in the area. Such places were used as reservoirs for stocking suitable birkas with *Gambusia*.

## 2.—Work carried out inside the Station.

During this year 26,000 blood specimens were examined for malaria. The following table shows a comparison of the cases examined during the last four years :—

TABLE 17

Year	Number	Examined	Positives	Percentage	B.T.	M.T.	Q.
<b>1933</b> ...	4,586	—	316	6·8	5·9	0·9	1 case
<b>1934</b> ...	8,674	—	736	8·4	7·9	0·5	—
<b>1935</b> ...	10,000	—	3,094	15·5	9·9	5·6	1 case
<b>1936</b> ...	26,000	—	6,602	25·4	9	16·4	—

From the above table, it will be noticed that the percentage of malaria in 1936 is higher than in 1935. This may be attributed to the following causes :—

(1) A tendency of malignant malaria to increase in 1935, being ten times higher than in 1934, with the subsequent result of an outbreak of malignant malaria in 1936. This is shown in the table 17 above. The percentage of M.T. is higher than that of B.T. in 1936, whereas it was lower in previous years.

This outbreak was general all over Egypt and is characteristic of the outbreak of malignant malaria. In Khanka the outbreak was first noticed in Gabal El-Asfar farm.



(2) A high percentage of malaria among patients attending the Khanka Malaria Station from areas, which are not under the control of the station (see table 18).

(3) Extension of rice cultivation in the area controlled, which previously did not cultivate rice.

(4) Extensive malaria surveys carried out by tents, which were sent to places showing a high incidence of malaria.

The following table gives a comparison of the percentage of malaria in the area controlled by the Khanka Malaria Research Station and from neighbouring places which are not under the control of the station:—

TABLE 18

Year	Inside the Area	Outside the Area
<b>1934</b> ... ..	8·5	8·8
<b>1935</b> ... ..	12·6	33·9
<b>1936</b> ... ..	17·7	43·9

From the above table, it will be noticed, that the percentage of malaria in areas, which are not controlled by the Khanka Station, rose from 8·8 in 1934 to 43·9 in 1936, whereas in the area controlled the percentage of malaria rose from 8·5 in 1934 to 17·7 in 1936. Again the percentage of malaria in 1936 was 17·7 in the area controlled by the station and 43·9 in the areas not controlled, *i.e.* lying outside the boundaries of the area in which anti-malaria measures are taken by the station. This gives an indication of the efforts of Khanka Malaria Research in controlling malaria.

The following table shows the sources from which the blood films were taken or sent:—

TABLE 19

Locality	Number examined	Positives	Percentage
Patients attending the station ...	7,641	4,022	52·9
Films brought from the villages ...	10,850	1,034	9·5
„ received from Sindiwa tent	2,342	1,040	44·4
„ „ „ mental hospital			
and other institutions ... ..	3,098	936	7·6
Other films ... ..	2,069	270	11·1
<b>TOTAL</b> ... ..	<b>26,000</b>	<b>6,602</b>	<b>25·4</b>

From this table it is evident that the percentage of malaria in the outpatients and in the films brought from the tent of Sindiwa is high, because generally only patients who have malaria or some sort of fever present themselves.

The following table shows the monthly distribution of malaria cases :—

TABLE 20

Months	Number examined	Positives for Malaria	Percentage	B.T.		M.T.	
				Positive	%	Positive	%
January ... ..	2,005	126	6·3	38	1·6	88	4·3
February ... ..	2,199	37	1·6	23	1	14	0·6
March ... ..	2,141	32	1·5	35	1·3	7	0·3
April ... ..	1,781	48	2·7	43	3·4	5	0·3
May ... ..	2,780	257	9·2	230	8·2	27	1
June ... ..	1,874	724	38·6	413	22	311	16·6
July ... ..	2,735	941	34·4	425	15·5	516	18·9
August ... ..	2,891	1,111	38·4	474	16·4	637	22
September ... ..	2,142	1,109	51·7	355	16·5	754	35·2
October ... ..	2,477	1,235	49·8	235	9·4	1,000	40·4
November ... ..	1,525	743	48·7	62	4·1	681	44·6
December ... ..	1,450	239	16·4	15	1	224	15·4
TOTAL ... ..	26,000	6,602	25·4	2,338	9	4,264	16·5

From the above table the following conclusions may be drawn :—

(1) The incidence of malaria which was moderate at the beginning of the year, rose suddenly in June. This is due to the outbreak of malaria at Gabal El-Asfar farm.

(2) The ratio of malignant malaria to benign tertian is high in 1936, in comparison to previous years. The ratio being 18 : 10 in 1936, as compared to 5·5 : 10 in 1935.

(3) The malarial months are from June to November. The increased percentage of malaria from June to August is due mainly to the outbreak of malaria at Gabal El-Asfar farm.

From August upwards there was an outbreak of malaria, which prevailed all over Lower Egypt.



The following table shows the distribution of malaria in the different villages during 1936 :—

TABLE 21

Months	Number examined	Positive	Percentage	B.T.		M.T.	
				Positive	%	Positive	%
El-Menayar ... ..	600	172	28·7	28	4·7	144	24
Kafr Hamza ... ..	665	176	26·5	84	12·7	92	13·8
Kafr Ebyan ... ..	305	81	26·5	46	15·4	34	11·1
El-Manayel ... ..	695	182	26·2	114	16·4	68	9·8
Seryakous ... ..	1,030	226	22·9	106	10·3	130	12·6
El-Marg ... ..	818	187	22·8	102	12·4	85	10·4
Sindiwa ... ..	2,274	503	22·1	243	10·7	260	11·4
El-Khanka ... ..	6,025	1,243	20·6	234	3·9	1,009	16·7
El-Alag ... ..	984	170	17·2	81	8·2	39	9
Abu Zaabal ... ..	1,320	323	16·7	95	7·1	128	9·6
El-Khosous ... ..	539	46	8·5	18	3·3	28	5·2
El-Menaya ... ..	273	15	5·5	8	2·9	7	2·6
El-Birka ... ..	2,330	55	2·3	21	0·9	34	1·4
Kafr El-Shorafa ... ..	608	6	1	—	—	6	1
Outside the area							
TOTAL ... ..	26,000	6,602	25·4	2,338	9	4,264	16·5

From the above table it will be seen, that the high percentages of malaria were obtained in Kafr Hamza, Kafr Ebyan, El-Manayel, Seryakous, El-Marg, Sindiwa and El-Khanka. This is mainly due to the extension of rice cultivation in the vicinity of these villages. The effect of rice cultivation on malaria can be seen by comparing the percentage of malaria in villages which are near to rice cultivation and those which are far from such cultivation. In the former the percentage is 22·8 and in the latter it is 11·2.

The unusual high percentage of malaria at El-Khanka village in 1936 is also due to the epidemic of malaria among the labourers of Gabal El-Asfar farm.

The highest percentage of malaria was obtained at El-Menayar village. This village is situated at the extreme northern boundary of the area controlled and is about 15 kilometres from the Khanka Station. Mainly malarious patients used to attend the station for treatment.

In the following table is shown the age distribution in all the cases examined during 1936:—

TABLE 22

Age						Number examined	Number of Positives	Percentage
								%
Less than one year	...	...	...	...	...	699	80	11·4
From 1—10 years	...	...	...	...	...	5,509	1,229	22·3
„ 10—20	„	...	...	...	...	5,363	1,433	26·7
„ 20—30	„	...	...	...	...	6,922	2,096	30·2
„ 30—40	„	...	...	...	...	4,475	1,094	24·4
„ 40—50	„	...	...	...	...	1,848	382	20·6
More than 50 years	...	...	...	...	...	1,185	288	24·3
TOTAL						26,000	6,602	25·4

The above table shows that the percentage of malaria in infants is about half the percentage of malaria found after the first year of life. The percentage of malaria in infants has been taken as an index of the incidence of fresh malaria, whereas the percentage of malaria after the first year of life is taken as an index of both fresh and relapsing malaria.

In infants both the mother and child were examined and doubtful cases of fresh infections among infants were omitted from the table.

In the following table the monthly distribution of the percentage of malaria among infants is given as an index of fresh infection:—

TABLE 23

Month	Number of Infants	Number of Positives	General Percentage		B.T		M.T	
			New Infection	Relapse	New Infection	Relapse	New Infection	Relapse
			%	%	%	%	%	%
January	37	—	—	6·2	—	1·9	—	4·3
February	62	—	—	1·6	—	1	—	0·6
March	60	—	—	1·5	—	1·2	—	0·3
April	49	1	2	0·7	2	0·4	—	0·3
May	83	2	2·4	6·8	2·4	5·8	—	1
June	93	13	9·7	28·9	6·5	15·5	3·2	13·4
July	74	14	30	4·4	8·4	7·4	21·6	—
August	72	19	23·6	14·8	4·2	12·2	19·4	2·6
September	41	10	21·9	29·8	14·6	1·9	7·3	27·9
October	59	16	25·3	24·5	15·2	—	10·2	30·3
November	55	5	9	39·7	1·8	2·3	7·2	37·4
December	14	0	—	16·4	—	1	—	15·4
TOTAL	699	80	11·4	14	4·8	4·1	6·6	9·8



From the above table, it may be noticed that relapses of malaria occur during all the months of the year.

The ratio of fresh infection to relapses is 12 to 10 in benign tertian malaria and 7 to 10 in malignant malaria. Thus, there is comparatively more fresh infections in benign tertian malaria than in malignant malaria.

In the following table is shown the percentage of malaria and of enlarged spleen in the outpatients coming from different villages :—

TABLE 24

Villages	Number of Outpatients	Percentage of Enlarged Spleen in them	Percentage of Malaria in them
El-Menaya ... ..	34	17·6	32·8
El-Khanka ... ..	565	28·7	34·1
Abu Zaabal ... ..	445	32·1	40·4
El-Birka ... ..	36	33·3	61·1
El-Menayar ... ..	377	33·9	44·8
El-Marg ... ..	371	34·7	48·2
El-Khosous ... ..	83	37·3	48·1
Kafr El-Shorafa ... ..	8	37·5	58·3
Sindiwa ... ..	173	37·5	58·3
Kafr Hamza ... ..	300	38·6	51
Siryakous ... ..	395	40	56·9
El-Alag ... ..	312	41·6	49
Kafr Ebyan ... ..	160	43·9	48·7
El-Manayel ... ..	121	50·4	55·3

This table shows that the percentage of enlarged spleen in the villages goes almost hand in hand with the increase of malaria, but it could not be considered as an ideal measure of the amount of malaria in them.

The following table shows the same two percentages in the different months of the year:—

TABLE 25

Months	Number of Outpatients	Percentage of Enlarged Spleen in them	Percentage of Malaria in them
January ... ..	76	23·6	18·4
February ... ..	53	30·2	7·5
March ... ..	76	28·9	14·5
April ... ..	90	37·7	37·8
May ... ..	235	46·8	50·2
June ... ..	486	43·4	53
July ... ..	544	25·7	46·6
August ... ..	791	65·1	51·2
September ... ..	1,541	54·2	58·4
October ... ..	1,942	29·7	57·6
November ... ..	1,278	38·5	54·3
December ... ..	529	43·2	38·9

From this table one concludes the following :—

(1) The percentage of enlarged spleen is high in the malarial months of the year, especially when the cases are mostly relapses.

(2) The percentage of malaria is higher than that of enlarged spleen in the malarial months of the year and lower in the rest of the year, when cases of enlarged spleen are then mostly due to other causes.

The enlargement of the spleen was found a little higher in malignant malaria than in benign. In the former it was found in 92 per cent of the cases and in the latter in 86 per cent of the cases. The statistics were made during August.



## SECTION. V.—Outpatient Clinic

### THE RESULT OF THE WORK OF THE OUTPATIENT CLINIC

#### A.—*Examination of Cases*

Patients attending the outpatient clinic are subjected to the following examinations :—

- (1) Clinical examination.
- (2) Urine and stools for helminthic ova, etc.
- (3) Further examinations as condition requires :—
  - (a) Hæmatological, blood film, total and differential counts, Hb., W.R., Widal and blood culture.
  - (b) Urine, for albumen, sugar, biles and casts.
  - (c) Rectal and sygmoidoscopic examination.
  - (d) Cystoscopic examination.
  - (e) For X-Ray, patients are referred to Kasr el-Aini Hospital.

The total number of the new cases dealt with during the year 1936, was 8,627.

#### B.—*Parasitic Infection*

TABLE 26.—INCIDENCE OF INFECTION AMONG THE OUTPATIENTS  
AS REVEALED BY URINE AND STOOL EXAMINATION

Nature of Infection	Number
Total of urines examined ... ..	8,555
Schistosoma hæmatobium ova in urine ... ..	3,708
Schistosoma mansoni ova in urine ... ..	18
Total number of stools examined ... ..	8,056
Schistosoma hæmatobium ova in stools ... ..	246
Schistosoma mansoni ova in stools ... ..	2,761
Ascaris lumbricoides ova ... ..	1,954
Tænia saginata ... ..	85
Enterobius vermicularis ... ..	415
Trichostrongylus ova ... ..	891
Hymenolepis nana ... ..	326
Hymenolepis diminuta ... ..	2
Trichocephalus trichuris ova ... ..	85
Stronglyoides stercoralis larvæ ... ..	42
Heterophyes heterophyes ... ..	3

## RESULTS OF TREATMENT OF PARASITIC INFECTION

### *Results of Treatment of Schistosomiasis*

Fouadin was the drug used for the routine treatment. The dose varied according to the weight of the patient (adult 60 kilos received 3·5 to 5 cc. for 9 injections). At the end of the injections examination was carried, and if living ova were found, further two injections were given and so on up to 20 injections during this year.

Re-examination was done after one, two and three months when the patient returned.

The general results of the treatment of urinary and intestinal Schistosomiasis are as follows :—

Number of patients who completed the course of nine injections	...	...	...	...	...	1,696
(1) Number cured after nine injections	...	...	...	...	...	880
Re-examination results after one month	...	109	cured	12	relapsed	
"                    "            " two months	...	27	"	19	"	
"                    "            " three months	...	31	"	10	"	
Patients who did not continue additional injections	...	...				162
(2) Number cured after eleven injections	...	...	...	...	...	328
Re-examination results after one month	...	21	cured	7	relapsed	
"                    "            " two months	...	13	"	6	"	
"                    "            " three months	...	7	"	5	"	
Patients who did not continue additional injections	...	...				80
(3) Number cured after thirteen injections	...	...	...	...	...	145
Re-examination results after one month	...	6	cured	1	relapsed	
"                    "            " two months	...	4	"	1	"	
"                    "            " three months	...	2	"	1	"	
Patients who did not continue additional injections	...	...				14
(4) Number cured after fifteen injections	...	...	...	...	...	76
Re-examination results after one month	...	—	cured	3	relapsed	
"                    "            " two months	...	1	"	3	"	
Patients who did not continue additional injections	...	...				11



TABLE 27.—DETAILED RESULTS OF TREATMENT OF THE TWO SPECIES OF SCHISTOSOMA (HAEMATOBIMUM AND MANSONI) INFECTING EITHER URINARY OR INTESTINAL TRACT (See TABLE 3)

Infection		Result after 9th Injection						Result after 11th Injection						Result after 13th Injection						Result after 15th Injection						Total treated							
		Cured	Re-examined			Stopped	Cured	1 m	Re-examined		Stopped	Cured	1 m	Re-examined		Stopped	Cured	1 m	Re-examined		Stopped												
			1 m	2 m	3 m				1 m	2 m				3 m	1 m				2 m	3 m		1 m	2 m	3 m									
		—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+	—	+
Urine	Stools																																
S.h.	—	774	100	7	26	19	29	8	140	270	18	7	10	6	5	4	66	124	6	1	4	1	2	1	7	62	—	3	1	3	—	8	1,451
S.h.	S.h.	21	—	1	1	—	—	—	9	17	—	—	1	—	—	1	6	5	—	—	—	—	—	4	9	—	—	—	—	—	1	72	
S.h.	S.h.	20	4	2	—	—	—	1	7	19	2	—	—	—	1	—	6	11	—	—	—	—	—	3	4	—	—	—	—	—	1	71	
—	S.m.	48	3	1	—	—	2	1	3	14	1	—	1	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	1	68	
S.h.	S.m.	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	1	4	
—	S.h.	14	—	1	—	—	—	—	1	4	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19	
S.h. m.	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
S.h. m.	S.m.	1	—	—	—	—	—	—	2	4	—	—	—	—	1	—	2	1	—	—	—	—	—	—	—	—	—	—	—	—	—	10	
TOTAL ...		880	107	12	27	19	31	10	162	328	21	7	13	6	7	5	80	144	6	1	4	1	2	1	14	76	—	3	1	3	—	12	1,696

TABLE 28.—SHOWING STATISTICS OF THE PATIENTS ATTENDNING  
THE O.P. DURING THE YEAR 1936 IN EVERY MONTH

Month	Females less than 12 Years	Females more than 12 Years	Males less than 12 Years	Males more than 12 Years	Total
January ... ..	65	216	60	424	771
February ... ..	12	254	16	453	735
March ... ..	10	149	15	390	564
April ... ..	12	193	17	492	714
May ... ..	28	235	27	500	780
June ... ..	25	187	41	497	750
July ... ..	32	182	37	538	780
August ... ..	21	160	22	577	780
September ... ..	27	194	53	506	780
October ... ..	21	159	56	524	780
November ... ..	29	162	65	493	749
December ... ..	17	79	40	308	444
Total ...	290	2,100	455	5,702	8,547

Untoward symptoms resulted during the treatment of Schistosomiasis in the O.P.

#### RESULTS OF TREATMENT OF HELMINTHIC INFECTION

(1) *Ancylostoma deudendale* is treated with carbon tetrachloride, dose 5 cc. for the adult 60 kilos weight.

(2) *Ascaris lumbricerds* is treated with ascaridol dose 1.5 cc. for the adult with 40 gm. castor oil.

(3) *Ancylostoma* and *ascaris* infection combined is treated with mixture of carbon tetracholride and oleum chenopodium each 2.25 cc. given with 90 cc. mag. sulph. solution. In cases where *ascaris* infection is heavy (*ascaridol*) was administered alone.

(4) *Tænia saginata* is treated with extract filixs liquidum (fresh extract) dose 5 gm. for the adult given with mag. sulph.

(5) *Entrobis vermicularis* is treated with C.T.C. as given for *Ancylostoma*, in the same dose.

Re-examination : Patients are re-examined after one week from giving the drug, if negative, they are asked to attend monthly for re-examination for three months but if positive again additional treatment is given.

The results of treatment are shown on next page.



TABLE 29

Infection	Result after 1st Purge										Result after 2nd Purge						Result after 3rd Purge						Result after 4th Purge						Total treated
	Cured					Re-examined					Cured	Re-examined					Cured	Re-examined					Cured	Re-examined					
						Stopped						Stopped						Stopped						Stopped					
	1 m	2 m	3 m	1 m	2 m	3 m	1 m	2 m	3 m	1 m	2 m	3 m	1 m	2 m	3 m	1 m	2 m	3 m	1 m	2 m	3 m	1 m	2 m	3 m	1 m	2 m	3 m		
Ancylos. duodenale	752	24	3	13	2	5	1	231	102	5	2	3	4	42	40	4	1	4	—	—	27	9	—	1	2	8	—		
Ascaris ... ..	435	46	1	22	1	18	—	6	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	464			
Ancylo. and Ascaris	168	15	4	3	2	5	—	105	75	6	1	1	1	26	18	1	—	—	1	5	9	—	—	—	3	409			
Enterobius ... ..	138	21	1	4	—	5	1	5	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	147			
Tænia 5 ... ..	34	2	1	5	—	2	2	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	38			
Hymenolepis nana...	24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	24			
“ diminuta	136	—	—	1	—	—	—	—	9	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	146			
Trichostrongylus ...	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5			
Trichocephalus ...	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1			
Heterophyes ...	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6			
Strongyloides ...	1,699	108	10	48	5	35	4	349	197	11	3	4	5	68	58	5	1	4	—	5	36	9	—	1	2	11	1,240		

## SECTION VI.—Clinical Report

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### ANAEMIAS

#### *Hæmoglobin Regeneration in Hypochromic Anaemias*

Iron deficiency is the main factor in the production of hypochromic anaemias of varied aetiology, whether the deficiency be nutritional (deficient intake or absorption) or due to loss of stored iron, the latter is a more important factor.

The administration of iron in these cases is followed by hæmoglobin regeneration as well as stimulation of erythropoiesis.

The latter is the better measure of response in anaemias due to cellular deficiency, whereas in hypochromic anaemias the important point is to find out whether and to what extent the organism is capable of utilising the iron introduced therapeutically for Hb. construction rather than gauging the stimulation of erythropoiesis.

The following experiments were undertaken to define the relation of these two different cases :—

(1) Minimal doses of iron stimulated the bone-marrow and resulted in a reticulocytic rise but were not sufficient to produce an increase of Hb.

(2) Different quantities of iron may result in similar degrees of reticulocytic rise but in different degrees of Hb. increase.

Although the rise of hæmoglobin is proportionate to the doses of iron administered, it is not related to the increase in reticulocytes.

(3) We met with cases in which maximal doses of iron resulted in marked increase in hæmoglobin with only slight reticulocytic response.

These experiments show that these two different actions of iron in hypochromic anaemia are at least not related quantitatively.

Accordingly the rise of Hb. within a certain period was taken as the criterion of response in the following study, in which the factors influencing Hb. in these anaemias were investigated. *Ancylostoma* anaemia was chosen as a typical example of this anaemia and the results in pure cases, cases with various clinical manifestations and cases with complicating morbid conditions are compared, while the patients are kept under exactly similar conditions with no change in their diet or environment, so that the results obtained will be comparable and only attributed to the administration of iron.



*Hæmoglobin Regeneration in Pure Ancylostoma Anaemia.*

In this group of 32 cases the influence of age, sex, the degree of anaemia, degree of infection, presence of enlarged liver and presence of oedema on the rate and degree of hæmoglobin regeneration was studied with the following results :—

(a) *Age*.—The patients were divided into the following age groups :—

TABLE 30

	Average	Maximum	Minimum
	%	%	%
<i>Group I: below 15 years (6 cases):—</i>			
Hb. rise at the end of the 1st week	11·3	21	9
„ „ „ 2nd „	18·6	21	14
<i>Group II: 15–25 years (8 cases):—</i>			
Hb. rise at the end of the 1st week	9·4	16	7
„ „ „ 2nd „	20	21	18
<i>Group III: 25–35 years (8 cases):—</i>			
Hb. rise at the end of the 1st week	10·5	15	7
<i>Group IV: 35–45 years (5 cases):—</i>			
Hb. rise at the end of the 1st week	11	12	10
„ „ „ 2nd „	19	21	13
<i>Group V: 50–65 years (5 cases):—</i>			
Hb. rise at the end of the 1st week	7	12	5
„ „ „ 2nd „	15·7	17	9

(b) *Sex*.—In the series studied there were 12 females and 20 males. (Males being more exposed to infection.) Female group :—

TABLE 31

	Average	Maximum	Minimum
	%	%	%
♂ Hb. rise at the end of the 1st week	10	18	6
♂ „ „ „ 2nd „	20	21	15
♀ „ „ „ 1st „	11·3	16	6
♀ „ „ „ 2nd „	19	24	12

(c) *Degree of anaemia.*—To study whether the initial degree of anaemia affects the degree and rate of hæmoglobin regeneration, the series has been divided into the following groups:—

TABLE 32

	Average	Maximum	Minimum
	%	%	%
<i>Initial Hb. : values below 20 per cent (5 cases) :—</i>			
Hb. rise at the end of the 1st week	10	15	6
„ „ „ „ 2nd „	20	24	12
<i>Initial hæmoglobin : 20-30 per cent (7 cases) :—</i>			
Hb. rise at the end of the 1st week	10·5	20	5
„ „ „ „ 2nd „	10	21	12
<i>Initial Hæmoglobin : 30-40 (12 cases) :—</i>			
Hb. rise at the end of the 1st week	10·25	20	5
„ „ „ „ 2nd „	18	21	13
<i>Initial Hæmoglobin 40-50 (5 cases) :—</i>			
Hb. rise at the end of the 1st week	11	14	6
„ „ „ „ 2nd „	19	21	14
<i>Initial Hæmoglobin 50-60 (3 cases) :—</i>			
Hb. rise at the end of the 1st week	9·5	11	7
„ „ „ „ 2nd „	18	22	11

(d) *Degree of infection.*—8 cases of very heavy infection were compared with the remaining 24 cases of moderate infection:—

TABLE 33

	Average	Maximum	Minimum
	%	%	%
<i>Heavy Infection :—</i>			
Hb. rise at the end of the 1st week	10·5	14	6
„ „ „ „ 2nd „	19	25	15
<i>Moderate infection :—</i>			
Hb. rise at the end of the 1st week	10	15	5
„ „ „ „ 2nd „	20	25	11



(e) *Presence of enlarged liver.*—In some cases of *Ancylostoma* anaemia the liver enlarges on account of fatty degeneration. Such liver enlargement was found in 6 out of 32 cases of this group.

TABLE 34

	Average	Maximum	Minimum
	%	%	%
<i>6 cases with liver enlargement :—</i>			
Hb. rise at the end of the 1st week	10·3	15	10
„ „ „ „ 2nd „	20	24	16
<i>26 cases without liver enlargement :—</i>			
Hb. rise at the end of the 1st week	10·5	15	5
„ „ „ „ 2nd „	20	25	12

(f) *Presence of oedema.*—In a previous publication it was demonstrated that oedema is not uncommon in this type of anaemia (in this series 4 out of 32, *i.e.* 12·5%) and is mostly due to hypoproteinaemia.

As protein is needed in the building-up of hæmoglobin, it was decided to compare the influence of oedema on the hæmoglobin regeneration in these cases:—

TABLE 35

	Average	Maximum	Minimum
	%	%	%
<i>4 cases with oedema :—</i>			
Hb. rise at the end of the 1st week	7·7	10	5
„ „ „ „ 2nd „	14	17	9
<i>28 cases without oedema :—</i>			
Hb. rise at the end of the 1st week	10·5	15	6
„ „ „ „ 2nd „	20	25	11

Although the number of pure *Ancylostoma* cases studied is not large, yet the data obtained from their analysis are more or less uniform and therefore conclusive. The results show that the degree of hæmoglobin regeneration under the same treatment, same diet and environmental conditions is not affected by age, sex, degree of anaemia, degree of infection, presence of enlarged fatty liver secondary to the anaemia, but is only diminished by the presence of oedema, which is not uncommon in these cases (12·5%) and which is mostly due to hypoproteinaemia. This shows that for the proper building-up of hæmoglobin, the presence of utilisable protein is important in hypochromic anaemia.

The slightly diminished degree of hæmoglobin regeneration in old age is rather due to associated disease of the arteries peculiar to this age.

*The Effect of Associated Morbid Conditions on Hæmoglobin Regeneration in Ancylostoma Anaemia.*

A series of 70 cases of Ancylostoma anaemia associated with morbid conditions, common in Egypt was analysed to determine the effect they may have on the hæmoglobin regeneration :—

(1) Pyelocytitis, mostly due to a previous Bilharzial infection in 21 cases :—

Average Hb. rise at the end of the first week	...	6·3 %
„ „ „ „ „	second week	14·3 %

(2) *Hæmaturia*.—The association of this condition which is mostly due to active or old Bilharzia, with Ancylostoma anaemia interferes markedly with the degree and rate of hæmoglobin regeneration under iron therapy, as shown by the following figures obtained from 6 cases.

Average Hb. rise at the end of the first week	...	6·0 %
„ „ „ „ „	second week	11 %

(3) Disturbed kidney function, usually due to associated post-Bilharzia urinary infection was found in 5 cases :—

Average Hb. rise at the end of the first week	...	7 %
„ „ „ „ „	second week	15 %

(4) Cirrhosis with splenomegaly, mostly of Bilharzial origin was associated with Ancylostoma anaemia in 12 cases :—

Average rise at the end of the first week	... ..	8 %
„ „ „ „ „	second week	15 %

(5) *Syphilis*.—In 7 cases of pure Ancylostoma anaemia a positive Wassermann and Cahn reaction (++ to +++) was met with :—

Average Hb. rise at the end of the first week	... ..	9 %
„ „ „ „ „	second week	20 %

(6) Pellagra was associated with pure Ancylostoma anaemia in 7 cases :—

The response of these cases to iron therapy is shown in the following figures :—

Average rise at the end of the first week	... ..	8·5 %
„ „ „ „ „	second week	18 %



Although these figures do not suggest any interference with the hæmoglobin regeneration by the pellagic process, the individual response of three of these cases showing absence of HCL. is worth consideration :—

Case 1	{	Average Hb. rise after first week	...	...	...	6 %
		„ „ „ „ second week	...	...	...	14 %
Case 2	{	Average Hb. rise after first week	...	...	...	8 %
		„ „ „ „ second week	...	...	...	15 %
Case 3	{	Average Hb. rise after first week	...	...	...	8 %
		„ „ „ „ second week	...	...	...	15 %

(7) The association of Ancylostoma anæmia with other intestinal parasites, did not modify the degree and rate of Hb. regeneration as shown by the values found in 12 such cases (Ascaris, Hymenolepis Trichostrongylus, Oxyuris, Tænia saginata) :—

Average Hb. rise at the end of the first week	...	...	9 %
„ „ „ „ „ „ second week	...	...	20 %

The results obtained in a series of 70 cases with associated morbid conditions showed :—

(a) The association of hæmaturia and pyelocystitis with and without disturbed kidney function, which are mainly due to urinary Bilharziasis, either active or old, diminishes the degree of Hb. regeneration under iron therapy, although it does not prevent the effect entirely.

(b) Association with hepatolienal fibrosis usually Bilharzial, diminishes the degree and rate of Hb. regeneration in this anaemia under iron therapy ; this is due to concomitant intestinal lesions increasing the interference with iron absorption.

(c) Pellagra associated with Ancylostoma anaemia does not seem to hinder Hb. regeneration, unless it produces achylia gastrica, in which case the absorption of iron is diminished.

(d) The presence of syphilis does not interfere with the utilization of iron for Hb. regeneration in this anaemia.

(e) The presence of other intestinal worms common in Egypt does not seem to modify the degree of Hb. regeneration of Ancylostoma anaemia under iron therapy.

#### ACHOLURIC JAUNDICE

Three cases of familial acholuric jaundice were found in members of one family, the mother and two daughters showing the typical manifestations of the congenital type of the disease.

*Case 1.—I.H., a girl of 10 years :—*

Face : lemon-coloured, sclera tinged.

Liver ++ : Spleen +++++. Other organs : normal.

X-Ray of bones : normal.

*Hæmatological findings.*—Hb. 50 %/o. R.B.C. 2,840,000. Reticulocytes 4·8 %/o. Diam. Ind. 6·39. Vol. Ind. 0·82. Fragility 0·58-0·41. Platelets 90,880.

W.B.C. total 9,000. Differential Eos. 1 %/o. Neutr. 80 %/o. Lymph. 11 %/o. Mono. 8 %/o.

Bleeding time : 8 minutes. Tourniquet test : negative.

Clotting time : 2 minutes. Malaria parasites : negative.

Clot retraction : normal. Kahn ++ B.C.R. : negative.

Icterus index 10-15 units, V.B. Bergh delayed direct.

Urine : Urobilinogen +.

*Case 2.—L.H., (mother) 34 years. History of recurrent attacks of jaundice :—*

Mucus membranes pale, sclera slightly tinged, skin pale yellowish

Liver not felt. Spleen +++++.

*Hæmatological findings.*—Hb. 50 %/o. R.B.C. 2,800,000. Reticulocytes 4·4 %/o. Diam. Ind. 6·2 u. Vol. Ind. 0·82 u. Fragility 0·54-0·44. Platelets 50,400.

W.B.C. total 10,000. Differential Eos. 1 %/o. Neutr. 80 %/o.

Lymph. 12 %/o. Mono. 7 %/o.

Bleeding time, clotting time and clot retraction : normal.

Icterus index 23·5 units. V.B. Bergh delayed direct.

Urine : Urobilinogen +++++. Stools : normal colour.

*Case 3.—S.H., 6 years. No history of jaundice sclera not tinged :—*

Liver not felt. Spleen +.

*Hæmatological findings.*—Hb. 60 %/o. R.B.C. 3,260,000. Reticulocytes 0·4 %/o. Diam. Ind. 6·38 %/o. Vol. Ind. 0·5 u. Fragility 0·53-0·44. Platelets 150,000.

W.B.C. total 6,000. Differential Eos. 1 %/o. Neutr. 70 %/o.

Lymph. 24 %/o. Mono. 5 %/o.



Bleeding time, clotting time and clot retraction: normal.

Icterus index: 6u. V.B. Bergh week delayed direct.

Urine: Urobilinogen +, stools: negative.

The first two cases show both the clinical and hæmatological characteristics of familial acholuric jaundice, *i.e.* enlarged spleen, anaemia, jaundice, increased fragility of R.B.C., marked microcytosis (spherocytosis), high reticulocytic count, high icterous index of a delayed direct character and urobilinurea.

Although the third case did not present the manifestations of active phase of the disease, the hæmotological characteristics were present.

These three cases were of special interest, as there was besides the manifestations of acholuric jaundice, a pronounced tendency to hæmorrhage since childhood.

Does this association of acholuric jaundice and hæmorrhagic diathesis in the same members of one family indicate the combined constitutional abnormality of both red blood corpuscles and platelets, or does it suggest a constitutional hypersplenism leading to hæmolysis and intermittently excessive destruction of platelets? The low platelet counts in the first two cases, where there was active hæmolysis, are rather suggestive of the latter.

Splenectomy without blood transfusion was performed in the first two cases with satisfactory results. The jaundice disappeared by the end of the first week and the reticulocytic count became normal 3–4 days after operation. Hb. improved and the diameter index showed a slow increase which started about the end of the first week. In contradistinction to the findings in Thrombocytopenic purpura though the platelet counts improved, the tendency to hæmorrhage remained.

The spleens removed at operation were submitted to histological examination. The pulp hyperaemia (arterial), the absence of fibrous tissue increase, the non-dilatation of the sinuses and the positive Prussian blue reaction found in both of them differentiate them definitely from the histological picture of Bilharzial hepatolienal fibrosis.

Two cases of chronic hæmolytic anaemia which could be classified as acquired acholuric jaundice of Widal-Hayems were also met with; there was no increased fragility, no microcytosis and no family history in either of them. They resembled Cooley's type of erythroblastic anaemia as regards age, stunted growth, type of anaemia and splenomegaly but the type of nucleated red cells was normoblasts, the erythroblasts of the type met with in Cooley's anaemia being found only twice in the first case. The absence of changes in the long and short bones and in the bones of the skull was the only point differentiating them from typical Cooley's anaemia of a similar age.



### ANAEMIA AND ACHLORHYDRIA

The role of the stomach in the mechanism of different types of anaemia has been repeatedly emphasised. In hypochromic anaemia the diminished gastric secretion has been demonstrated to interfere with the absorption of food iron, thus producing a state of nutritional deficiency. This means that the demonstration of achlorhydria in cases of hypochromic anaemia is of aetiological significance.

In a series of cases of hypochromic anaemia common in Egypt (helminthic, chronic post-hæmorrhagic, idiopathic hypochromic, and dysentery anaemia) the relation of associated achlorhydria was studied.

It was found that the achlorhydria in these cases was produced in different ways :—

(1) The achlorhydria may be due to gastritis which is aetiologicaly different from the cause of the anaemia.

In this group the treatment of the anaemia does not alter the condition of the stomach, *i.e.* the achlorhydria persists in the majority of cases and may lead, especially in post hæmorrhagic and idiopathic anaemia, to relapse after the stoppage of the treatment.

(2) The achlorhydria may result from the causal agent of the anaemia (*Ancylostoma* anaemia and dysentery).

In this group the treatment of the anaemia does not usually affect the condition, but removal of the causal agents is generally followed by appearance of HCl. This occurs more often with *ancylostoma* than with dysentery anaemia. The occurrence of achlorhydria aggravates the degree of anaemia in this group.

(3) We met with cases of anaemia, especially of the post hæmorrhagic and *ancylostomic* type, associated with achlorhydria in which the treatment of the anaemia with iron alone resulted in the appearance of HCl, even if the causal agent (*ancylostoma*) with its effects on the intestinal tract still remains. This means that the anaemia can be a contributing factor in the aetiology of achlorhydria, *i.e.* in this group there is a vicious circle, the anaemic state helps in the disappearance of HCl, the resulting achlorhydria aggravates the anaemia.

### HEPATOSPLENOMEGALY

In this group we include cases of enlarged livers only, enlarged spleens only and enlarged liver and spleen.

The methods of investigating of these cases are those outlined in the previous reports and publication.



*Statistical data.*— During this year we have met with the following :—

Cases of enlarged livers : 542.

Cases of enlarged spleens : 198.

Cases of enlarged livers and spleens : 979.

The following tables show the various etiological factors met with in each group. It must be mentioned that pure cases due to one etiological factor are far less than cases with multiple factors:—

TABLE 36.—ENLARGED LIVERS ONLY

Livers	Total with Complication						
Number of Cases	Bilharziasis	Pure	Complicated	Syphilis	Typhoid	M.T.	B.T.
11	Intestinal S.M. ... ..	8	3	1	2	—	—
2	Intestinal S.H. ... ..	1	1	—	—	—	1
27	Intestinal S.M. and Urinary S.H. ... ..	20	7	5	1	—	1
33	Intestinal S.H. and Urinary S.H. ... ..	26	7	7	—	—	—
228	Urinary S.H. only ...	185	43	35	8	—	—
241	Negative Bilharzia ...	196	45	38	7	—	—

TABLE 37.—ENLARGED SPLEENS ONLY

Livers	Total with Complication						
Number of Cases	Bilharziasis	Pure	Complicated	Syphilis	Typhoid	M.T.	B.T.
4	Intestinal S.M. ... ..	2	2	1	1	—	—
1	Intestinal S.H. ... ..	—	1	—	1	—	—
6	Intestinal S.M. and Urinary S.H. ... ..	2	4	2	2	—	—
73	Urinary S.H. only ...	34	39	13	13	11	2
114	Negative Bilharzia ...	57	57	15	21	12	9

TABLE 38.—ENLARGED LIVERS AND SPLEEN

Livers	Total with Complication						
Number of Cases	Bilharziasis	Pure	Complicated	Syphilis	Typhoid	M.T.	B.T.
78	Intestinal S.M. ... ..	49	29	10	7	11	1
23	Intestinal S.H. ... ..	19	4	2	—	2	—
63	Intestinal S.M. and Urinary S.H. ... ..	40	23	10	7	6	—
81	Intestinal S.H. and Urinary S.H. ... ..	49	32	7	15	9	1
381	Urinary S.H. ... ..	223	158	47	64	24	23
353	Negative Bilharzia ...	203	150	43	44	48	15

These tables include all cases of enlarged spleens from one-finger size to huge spleens.

The object of these investigations is to define diagnostic criteria for the various types of splenomegalies met with in Egypt. For this purpose pure cases are only chosen.

*The size of the spleen.*—For determining the size of the spleen, especially for studying any variations in size occurring as a result of various lines of treatments, we draw the spleen by a skin pencil during fixed respiration using palpation and percussion. Our method is preferred to both Ziemann's and Schuffner's techniques for the following reasons :—

(a) This method shows the shape, the breadth as well as the length of the spleen.

(b) It included the intrathoracic portion of the spleen as well.

*The clinical classification of the commonest types of splenomegaly in Egypt.*—The term splenomegaly is used here to cases showing spleens enlarged three fingers or more below the costal margin. Ptosed spleens are excluded. Five such ptosed spleens were met with. As a result of studies of a vast number of cases in the Institute in the last five years, we can classify the commonest types of splenomegaly and describe the various diagnostic criteria for each in the following :—

#### 1.—*Bilharzial Hepatolienal Fibrosis.*

The first and most essential criterion for the clinical diagnosis of this condition is the demonstration of *cirrhosis of liver*. This is easy when the liver is enlarged below the costal margin, a sharp irregular



edge with hard liver (not usually nodular) is clinically sufficient. When the liver is not enlarged below the costal margin, the left lobe can be palpated in the epigastrium showing the same characteristics; signs of collateral circulation and the presence of obstructive ascites are additional evidences. The utilisation of the Takata-Ara reaction has given us some help in this direction; the results of applying this test to a large number of liver cases as well as studies on its possible mechanism will be published later.

When the presence of cirrhosis is established, the diagnosis lies between Bilharzial and syphilitic hepatolienal fibrosis; the differentiation rests on the detection of the etiological factors in the former by the demonstration of evidence of intestinal Bilharziasis by stool examination, swap, sigmoidoscope or even X-Ray by barium enema may be needed for the detection of high papillomata in cured cases. Eosinophilia is not of diagnostic value, unless marked, as it is present in some cases of hepatic syphilis. It was also met with in a case of haemocromatosis (University College, London).

The other two rare types of cirrhosis met with in Egypt, *i.e.* toxic cirrhosis and biliary cirrhosis may be associated with splenomegaly but could be easily differentiated clinically.

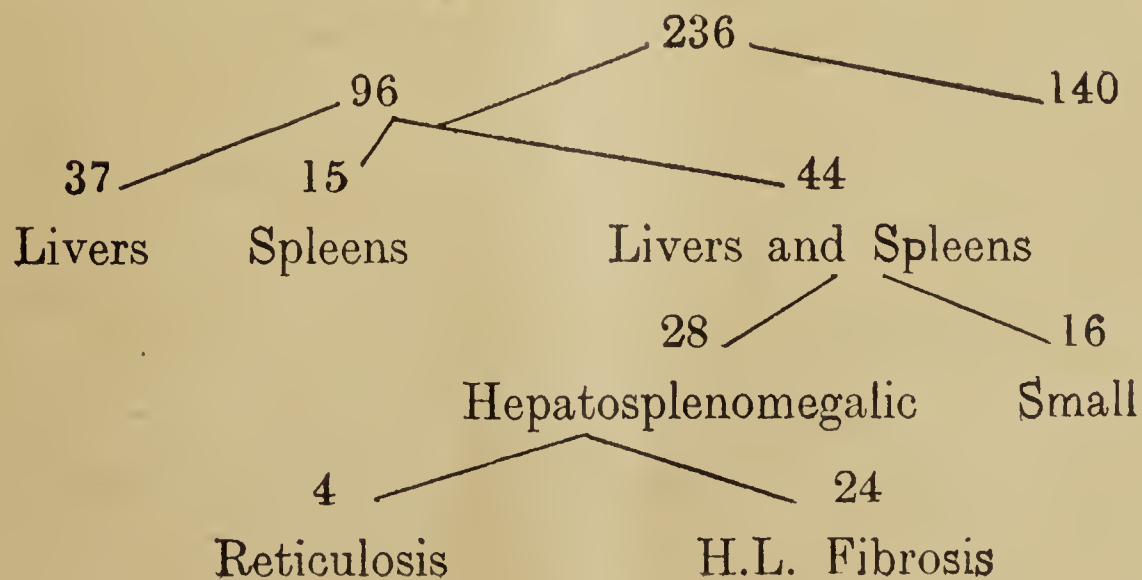
These observations were based on the study of pure cases of Bilharzial hepatolienal fibrosis, of which 157 cases were met with during this year; of these 111 were due to mansoni infection and 46 due to hæmatobium infection of the intestine.

## 2.—*Malarial Hepatosplenomegaly.*

The clinical differentiation of this group which constitutes the second commonest type of splenomegaly in Egypt will be described under malaria in this report.

## 3.—*Syphilitic Group of Splenomegalies.*

Positive serological tests (W. R. and Kahn) were found in 236 cases of enlarged livers and spleens:—



Large spleens were only encountered in the mixed group, *i.e.* hepatosplenomegalies and constitute 28 cases only. This is the group that concerns us here in relation to its diagnosis and differentiation from Bilharzial hepatolienal fibrosis. Detailed studies of this group resulted in recognising two different forms: (1) syphilitic hepatolienal fibrosis and (2) syphilitic reticulosis; these will be considered separately:—

1.—*Syphilitic hepatolienal fibrosis* (24 cases).

In studying this group very few information could be obtained that can help in their differentiation from Bil. H.L. fibrosis. The presence of cirrhosis differentiates it from malarial hepatosplenomegaly. Nevertheless, certain clinical as well as laboratory findings made this differentiation possible in some cases:—

(1) *Clinically*:—

- (a) The liver is grossly nodular in the majority of cases, such a liver was not met with in Bil. cases except on two occasions only.
- (b) The liver is more commonly tender, and patients complain frequently of pains usually intermittent; this is probably due to the frequency of perihepatitis.
- (c) The left lobe of the liver in these cases is usually more enlarged than the right. This sign is of great differentiating value in cases with enlarged livers.

(2) *Haematologically*:—

- (a) These cases are usually only moderately anaemic.
- (b) Eosinophilia, if present, is only of slight degree.
- (c) The reticulocytic counts are frequently slightly higher than normal.
- (d) Punctate basophilia has been met with in some cases. This is absent in Bilh. H.L. fibrosis.

The Bilharzia cutaneous reaction is negative if the patient has never had Bilharzia.

Demonstration of positive serological tests and absence of any evidence of intestinal Bilharziasis.

2.—*Syphilitic Reticulosis*.

4 cases were met with of hepatosplenomegaly and strongly positive serological tests which possess certain clinical and haematological features that differentiate them from the previous group of H.L.



fibrosis and suggest their nature as belonging to the reticulosis group. The differentiating features of this group are :—

- (a) Three of these cases were due to congenital syphilis occurring in patients of 12 and 14 years of age, and 1 occurred in a man of 38 years.
- (b) Clinically the enlarged liver and spleen do not show any special features, but in all glandular enlargement either generalised or localised (in one case mediastinal group was only affected) was found. The enlargement is usually slight.
- (c) Three of these cases presented themselves with purpuric rash ; this does not occur in the other groups.
- (d) All the four cases showed a hypochromic macrocytic anaemia which did not respond to iron, liver or marmite, suggesting a retrograde hypoplasia of the bone-marrow. The anaemia of the syphilitic H.L.F. group is usually normocytic and responds to iron.
- (e) In one case only signs of cirrhosis were present and in 2 cases the T.A. was positive.
- (f) The white blood picture showed high degree of monocytosis varying from 14 to 20 %<sub>o</sub>, the total count being within normal limits or slightly leucopenic. In all cases repeated search showed reticular monocytes which are considered to be diagnostic of reticulosis.
- (g) Material obtained from bone-marrow by sternal puncture showed definite increase in the reticulum cells (both plasmod and phagocytoid forms). No specific cells, *e.g.* lymphadenoma cells, Gaucher or malarial pigment were found to suggest such conditions as the cause of the existing reticulosis.
- (h) Three of these cases in whom anti-syphilitic treatment was tried, did not show any response of either the clinical or the hæmatological pictures. This is also usual with the syphilitic splenomegaly belonging to the other group. It is stated that such case responds after splenectomy.

To summarise : Syphilitic reticulosis is more commonly due to congenital syphilis, clinically it shows, in addition to hepatosplenomegaly, signs of involvement of other parts of the reticulo-endothelial system, *e.g.* glands, bone-marrow, etc. Hæmatologically it is usually associated with a hypoplastic macrocytic anaemia, tendency to purpura and monocytosis.

Malarial reticulosis does not show lymphadenopathy or purpura, the anaemia is usually normocytic unless the malaria is active when macrocytosis could be demonstrated temporarily; the malarial anaemia responds to anti-malarial therapy and iron.

Hodjkins disease is rare in the age of the three cases mentioned; sternal puncture may demonstrate lymphadenoma cells, and the biopsy of the gland as well as Gordon's test confirms the diagnosis.

*The Hæmopoetic group.*—Any case of splenomegaly should be suspected to belong to this group if:—

(a) No signs of cirrhosis are present and no malaria; an enlarged liver may be present in this group but it is usually soft.

We have met with two cases of leucosis associated with Bilh. H.L. Fibrosis.

(b) Purpura is present, this suggests always a hæmopoetic disease or reticulosis or terminal stage of toxic cirrhosis.

In three cases of Bilh. H.L. Fibrosis, purpuric rash was found with positive tournique test; investigation of these cases showed that this was due to concomitant infection in two cases and, avitaminosis C. in one case.

(c) Lymphadenopathy is present, suggests leucosis or reticulosis.

The final diagnosis of cases belonging to this group is arrived at by detailed hæmatological studies as those previously outlined in the publication; including bone-marrow puncture which is specially indicated in the aleukaemic group and purpuric states.

Cases of this group with their hæmatological characteristics are described in these reports under the section of anaemia and in the publications as they are met with.

Owing to the small material of the other rare forms of splenomegaly met with in Egypt, it is intended to describe their diagnostic criteria when sufficient data are available.

## MALARIA

### *Diagnostic Criteria of Malaria Hepatosplenomegaly and its Differentiation from Bilharzia Hepatolienal Fibrosis.*

Malarial hepatosplenomegaly constitutes the second commonest type of splenomegaly in Egypt. During this year, we met with



178 cases of malaria, the association of enlarged livers and spleens is shown in the following table :—

TABLE 39

	M.T.	B.T.	Total
Hepatomegaly only ... ..	2	2	4
Splenomegaly only ... ..	23	11	34
Hepatosplenomegaly ... ..	100	40	140

This table shows that malignant malaria is  $2\frac{1}{2}$  times more common in the causation of hepatosplenomegaly than benign tertian malaria. These data agree with those given in the previous report about malarial hepatitis. (See previous report.)

This type of hepatosplenomegaly resembles closely, in many cases the hepatosplenomegalic stage of Bilh. H.L. Fibrosis so much that, in certain cases, it was impossible to decide which of the two conditions is responsible for the clinical picture without more detailed investigations. This similarity has already been demonstrated by examining such cases in Fayum. (See previous report.)

As a result of this difficulty encountered in separating these two conditions, investigations were undertaken during this year to arrive at the proper diagnosis and differentiation of this group. This is not only important from the point of view of proper diagnosis and correct treatment, but also to save such cases from undergoing splenectomy which will expose them, in addition to the surgical risks, to lowering of their defensive mechanism against malaria and other infections as well.

The following observations and laboratory procedures were found of value in this connection :—

(1) *Clinically*.—There is nothing much to gain except when :—

(a) A typical history of regularly periodical rigors is given ; history of rigors of an irregular character is common in cases of Bilharziasis due to the presence of pyelitis.

(b) Tenderness of the liver and spleen are present ; the liver in pure cases of Bilharziasis is not tender. (See report of 1934.)

(c) The enlarged liver is not cirrhotic ; in addition to absence of clinical signs of cirrhosis, a negative T.A. is of value in this respect.

(2) *Hæmatologically* :—

- (a) There is no case of malarial hepatosplenomegaly without anaemia, although we have met repeatedly with cases of Bilh. H.L. Fibrosis with no or only very slight degree of anaemia.
- (b) Leucopenia is constant with malarial hepatosplenomegaly while it is present in less than half the cases of Bilh. H.L. Fibrosis at the hepatosplenomegalic stage. (*See previous report.*)
- (c) Monocytosis is suggestive of malaria ; it is not present in Bilh. H.L. Fibrosis (*see previous report*) ; but it was also found in the reticulosis group.  
Eosinophilia is absent in pure cases of malaria hepatosplenomegaly.
- (d) The reticulocytic counts are greater than normal as the anaemia in this condition is mainly hæmolytic. (*For the anaemia of Bilh. H.L. Fibrosis see previous report.*)

(3) *Biochemically* :—

- (a) The ictorus index is higher than normal in the majority of cases ; while it is normal or below normal in the hepatosplenomegalic stage of Bilh. H.L. Fibrosis.
- (b) The Takata-Ara reaction is negative in these cases (without parasites) while it is positive in Bilh. H.L. Fibrosis.
- (4) *Indirect evidences of malaria.* — In cases negative for malarial parasites after provocation, indirect evidences of malaria could be obtained from the following procedures :—
  - (a) Sternal puncture may show in some cases malarial pigment, but usually no parasites if these could not be demonstrated in the peripheral blood.
  - (b) Henry's flocculation reaction is usually positive in these cases, although its specific nature is not absolute.
  - (c) Quinine-reticulocytic-crisis : The administration of quinine resulted in these cases in an increase of the reticulocytic count which reaches its maximum about the fourth day. Similar reticulocytic rise occurred also after Atebrin administration. No such rise in the reticulocytic count occurred in cases of Bilh. H.L. Fibrosis.

*Experiments with Plasmochine.*

Cases of malaria under plasmochine treatment showed the black water fever syndrome, including excessive hæmolysis of the R.B.Cs. were reported from this Institute. (*See previous report.*) Owing to



the extreme difficulty encountered in these cases in deciding whether they were cases of genuine black water fever or the result of plasmochine poisoning, it was decided to study the effect of big doses of plasmochine in producing haemolysis. 6 dogs were given plasmochine in toxic doses, single and repeated by injection, the R.B.C. counts, fragility, reticulocytes and ictorus index were followed till the time of death. The results obtained showed no evidence of hæmolytic action of plasmochine. This does not exclude the possibility of idiocincrazy possessed only by some individuals.

## PELLAGRA

### *The Demonstration of the Hæmopoietic Principle in Chronic Pellagric Achylia.*

It was found that, although conditions associated with achylia are rather common in Egypt, Addisonian anaemia is extremely rare (Salah, 1935).

In cases of pellagra, which is of common occurrence among the fellaheen, achylia gastrica was demonstrated by the alcohol-histamine method in 1/3 of the cases. This figure is far smaller than the one obtained by using the fractional oatmeal method. Investigations into the nature of this pellagra achylia suggest an inflammatory process leading to an atrophic condition of the gastric mucosa, with a tendency to recovery of gastric secretion in exceptional cases only. (Salah, 1933).

Pellagra resembles Addisonian anaemia not only in the clinical manifestations, *e.g.* glossitis, achylia, cord lesions, remissions, etc., but also in the etiological origin from a deficiency state, the response of the two conditions to various kinds of treatment is also more or less similar.

Acquired achylia gastrica can give rise to megalocytic hyperchromic anaemia, if the process in the stomach affects also the formation of the intrinsic hæmopoietic principle. The demonstration of the intrinsic principle in the gastric secretion of chronic pellagric patients with achylia was attempted in order to explain the non-occurrence of a pernicious blood picture in these cases.

The absence of patients suffering from Addisonian anaemia rendered the use of the ordinary method of demonstrating the hæmopoietic principle (Castle, 1929) impossible, and therefore a biological animal test was used.

*Singer* (1935) showed that white rats on milk diet develop a constant low reticulocyte-level and they respond to the injection of normal gastric juice with a reticulocytic rise within 2-3 days.



This rise disappears on the fifth day. The R.R.R. (Rat reticulocytic reaction) is positive with gastric secretion from normal stomach; achylic stomach without anaemia, achylic hypochronic anaemia and hæmolytic anaemia, and is negative if gastric secretion of Addisonian anaemia cases is used, or if normal gastric juice is heated to destroy the intrinsic principle.

Following Singer's technique, 22 white rats were kept on milk and bread diet until the reticulocyte-level, after 2–4 weeks remained constant at 4–19°/‰ after an initial value of 80–100°/‰. The reticulocytes were counted by our own method (described in 1933), as it showed more constant results than the Kammerer's method which Singer employed.

5 chronic pellagrins with histamine negative gastric secretion and 2 *Ancylostoma* anaemia patients with achylia gastrica (one positive and one negative after histamine) were chosen for investigation.

The gastric juice was collected after injection of 1 mg. histamine, the fasting stomach having been washed repeatedly with distilled water, and injected into white rats, with a constant low reticulocyte-level. The gastric juice of each patient was injected into 2 rats and besides part of the gastric secretion of three of the pellagra cases was heated before the injection for comparison.

The unheated gastric secretion of the 5 pellagra cases as well as that of the 2 *Ancylostoma* anaemia cases produced definite reticulocytic crises in the rats injected with them, while the previously heated gastric juice did not affect the reticulocyte-level.

These findings show that the gastric lesions of chronic pellagra do not interfere with the formation of the intrinsic hæmopoietic principle nor is the formation of that principle inhibited in achylia gastrica due to *Ancylostomiasis*. The non-occurrence of hyperchromic megalocytic anaemia in this condition in Egypt is thus explained.

It can also be concluded that the pellagra-producing diet is not deficient in the extrinsic hæmopoeitic principle, and that this latter is different from the pellagra preventing factor.



Administrative Report

I.—PERSONNEL

The personnel of the Research Institute and the Endemic Diseases Hospital as sanctioned by the budget of 1936-1937:—

Number	Post	Grade	Remarks
1	Director ... ..	—	Voluntary Worker
1	Biochemist ... ..	3rd	
1	Parasitologist ... ..	4th	
1	Medical Entomologist ... ..	4th	
1	Clinical Pathologist ... ..	4th	
1	Bacteriologist ... ..	5th	
3	Medical Officers ... ..	6th	
1	Sanitary Engineer ... ..	5th	
1	Head Nurse ... ..	7th	
1	Clerk ... ..	8th	
1	Clerk ... ..	8th	Low Grade
1	Moawin ... ..	Hors Cadre	
1	Molahez ... ..	” ”	
11	Laboratory Assistant ... ..	” ”	
3	Nurse ... ..	” ”	
8	Male and Female Attendants ...	” ”	

II.—EXPENDITURE

Expenditure	Amount	
	L.E.	Mills.
Salaries of permanent staff ... ..	3,846	483
Salaries of hors cadre staff ... ..	1,041	737
Transport, travelling allowances and expenses ... ..	70	804
Food of in-patients and employés ... ..	279	988
Food of experimental animals ... ..	76	032
Gas, light and water ... ..	361	360
Telegrams and telephones ... ..	14	500
Equipment, furniture and laboratory materials ...	2,800	796
Uniforms ... ..	6	—
Petty expenses ... ..	10	055
Books and journals ... ..	12	445
Purchase of experimental animals ... ..	4	615
TOTAL ... ..	8,524	815

### *Cooking and Washing.*

The cooking and washing were carried out in the Anti-Rabic Institute. From the beginning of this year a special building was established in the Institute for this purpose, also a cook and washer-woman were appointed to carry out this work.

This facilitates the work and stops the complaints from changing the clothes for others worn out.

### *Buildings.*

No other buildings were erected ; all the laboratories and rooms have become crowded with the staff, apparatus, and chemicals. The Institute asked many a time for more buildings, but owing to the present financial circumstances nothing was built.

A new street was already opened between the Nile and the Institute, this prevents the dirt and dust coming from the neighbouring houses.

### *Library.*

It can be said that **our** library contains a big quantity of books and journals dealing with **parasitology**, tropical diseases and entomology.

### *Visitors.*

During this year the Institute was visited by many doctors amongst whom were :—

- (1) The Members of the International Congress of Surgery.
- (2) Dr. Briercliffe and others.



### List of Publications of the Staff during 1936

- (150) DR. M. SALAH.—The Demonstration of the Hæmopoietic Principle in Chronic Pellagic Achylia. Published in the Transactions of the Royal Society of Tropical Medicine and Hygiene, Vol. XXIX, No. 3, pp. 299–302.
- (151) DR. M. SALAH.—Studies on Anaemias in Egypt, V, Acholuric Jaundice. Published in the Journal of the Egyptian Medical Association, May 1936, Vol. XIX, No. 5.
- (152) DR. M. ABDEL-AZIM.—An Epidemic-Like Increase in Mortality in an Egyptian Village, Tanan, Qalybiya. Published in the Journal of the Egyptian Medical Association, Vol. V, May 1936, pp. 262–288.
- (153) DR. M. SOBKY.—Effect of Anti-Malaria Drugs on Malaria Parasites — Preliminary Note. Published in the Journal of the Egyptian Medical Association, May 1936, Vol. XIX, No. 5.
- (154) M. KHALIL BEY.—Individual Variation in the Excretion of Drugs as an Important Factor in their Therapeutic Results — A Practical Method for detecting the Schistosomiasis Cases with So-called Idiosyncrasy and Complications. Published in the Journal of the Egyptian Medical Association, June 1936, Vol. XIX, No. 6, pp. 285–305 and the Lancet, July 18, 1936, p. 132.
- (155) DR. M. ABDEL-AZIM.—The Life History of *L. Pyramidum* Loos. Published in the Annals of Tropical Medicine and Parasitology, Liverpool, Vol. XXX, No. 3, October 1936, pp. 351–356.
- (156) DR. S. MADWAR.—A Preliminary Note on *Anopheles Pharoensis* in Relation to Malaria in Egypt. Published in the Journal of the Egyptian Medical Association, October 1936, Vol. XIX, No. 10, pp. 616–617.
- (157) DR. M. SALAH.—Investigations on the Treatment of Malaria with Atebrin. Published in the Journal of the Egyptian Medical Association December 1936, Vol. XIX, No. 12, pp. 718–736.





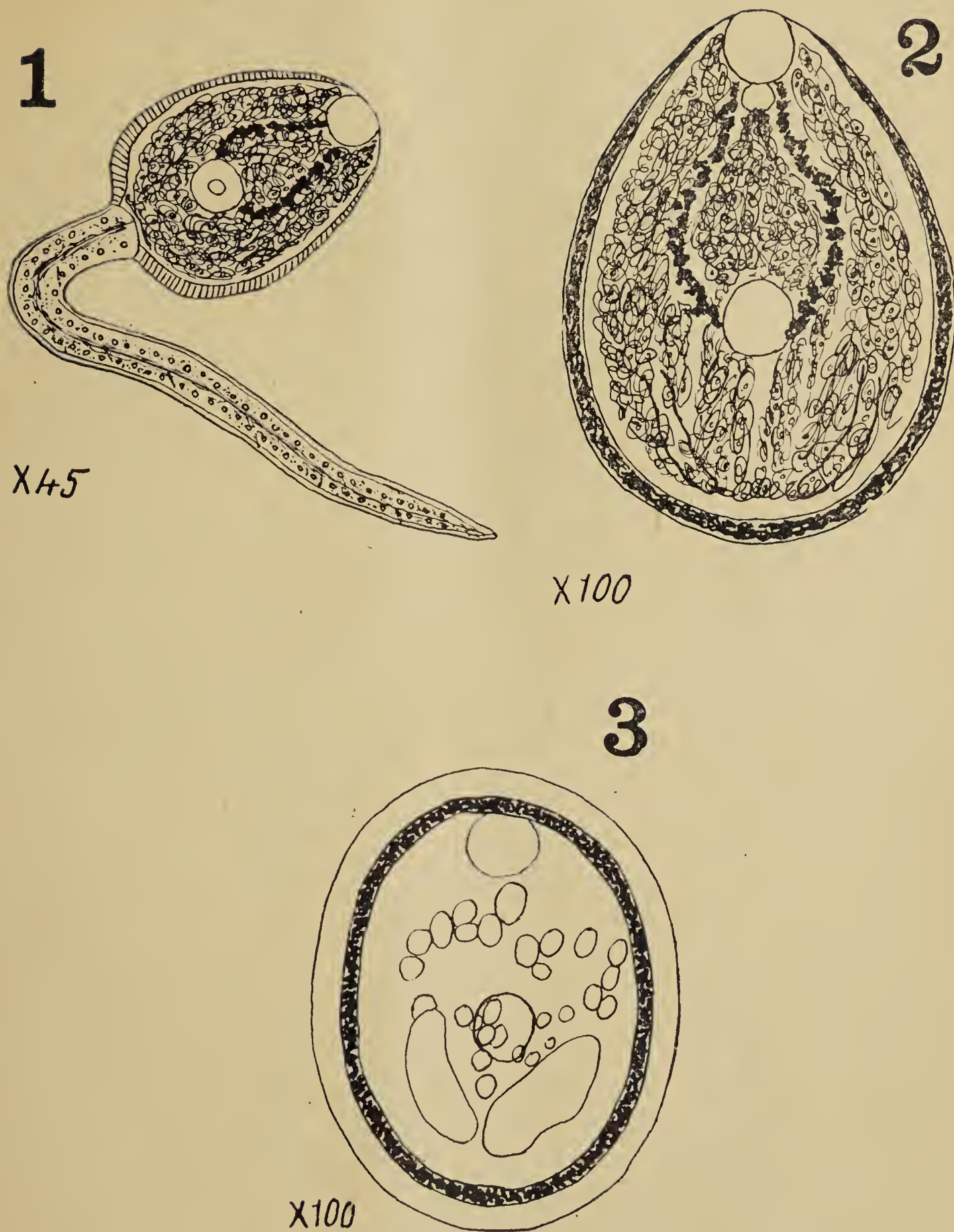


FIG. 1.—Showing the mature cercaria.

FIG. 2.—Showing the cercaria just before encystation.

FIG. 3.—Cyst.

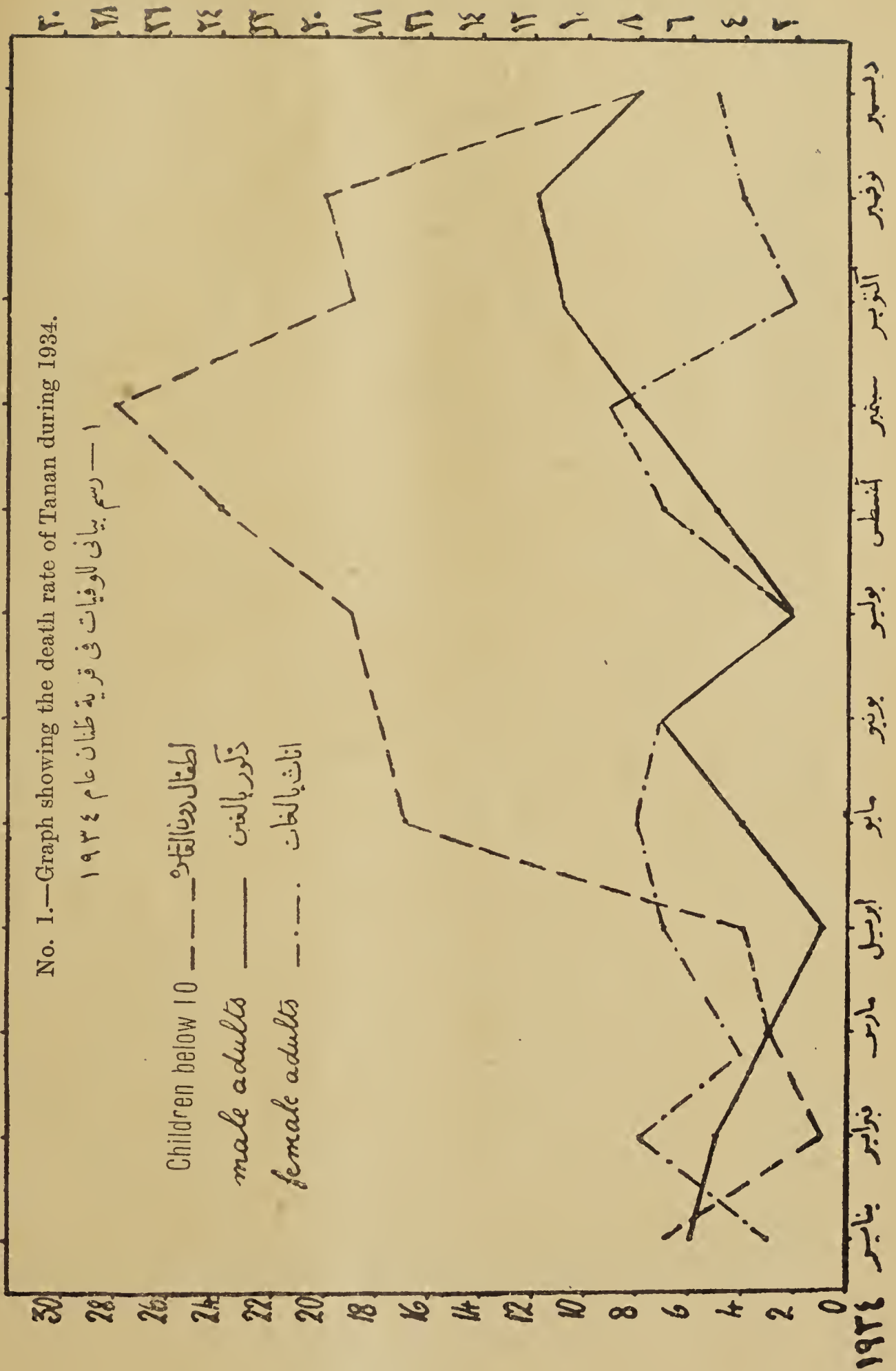




FIG. 4.—Ventral view of *L. caillandi*  
FIG. 5.—Dorsal view of the same snail



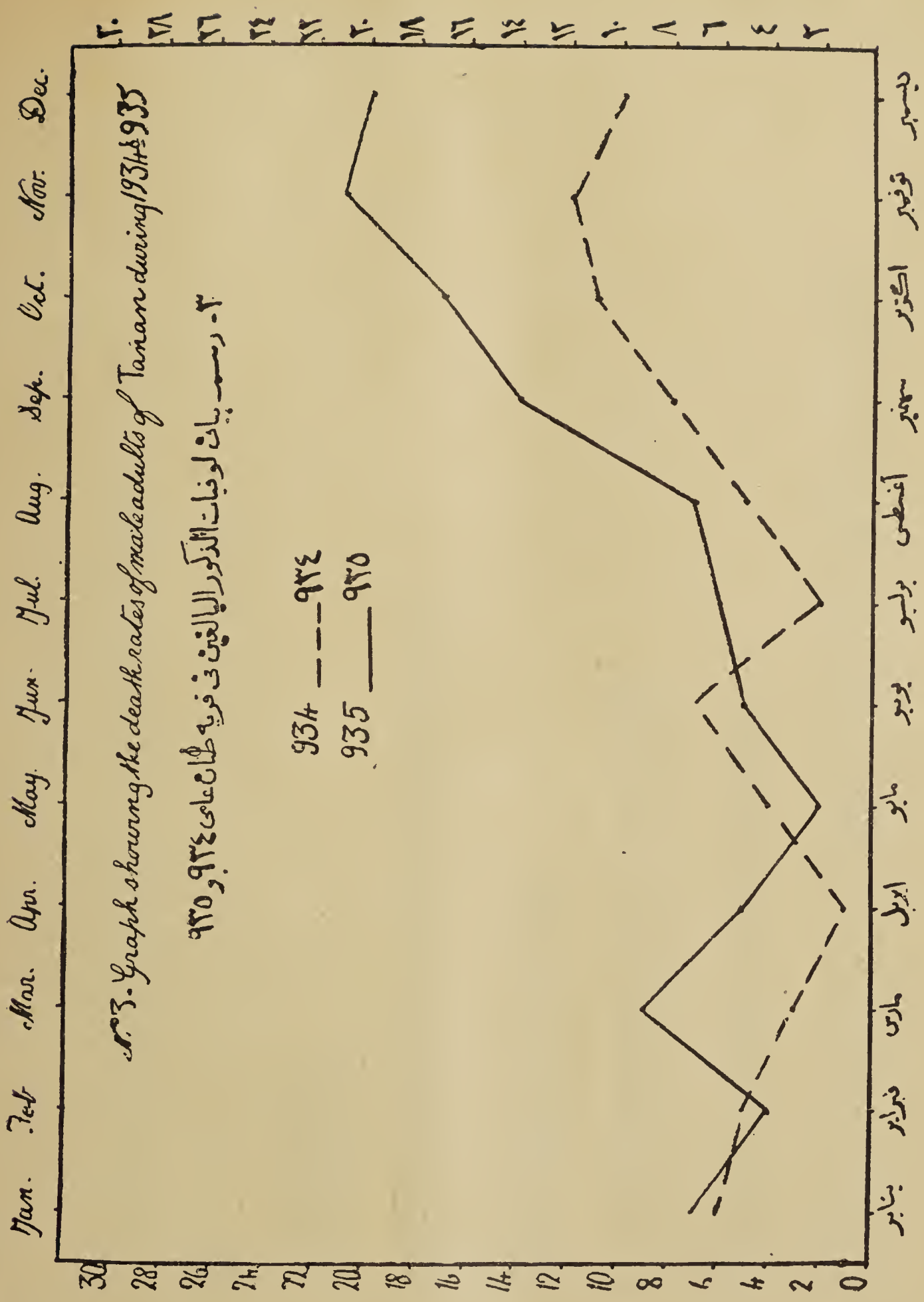
Jan. Feb. Mar. Apr. May. Jun. Jul. Aug. Sep. Oct. Nov. Dec.



Graph. 1.



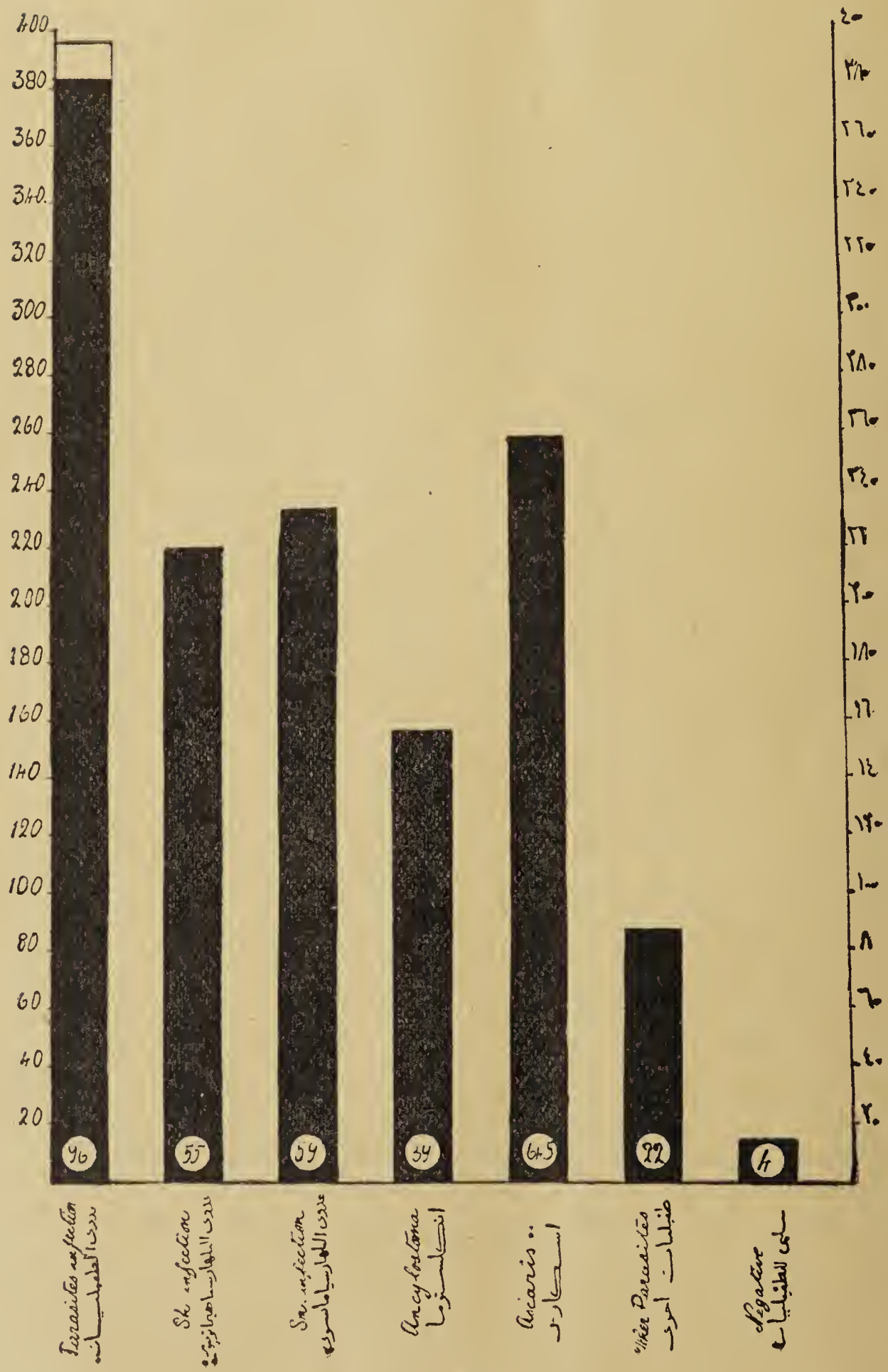




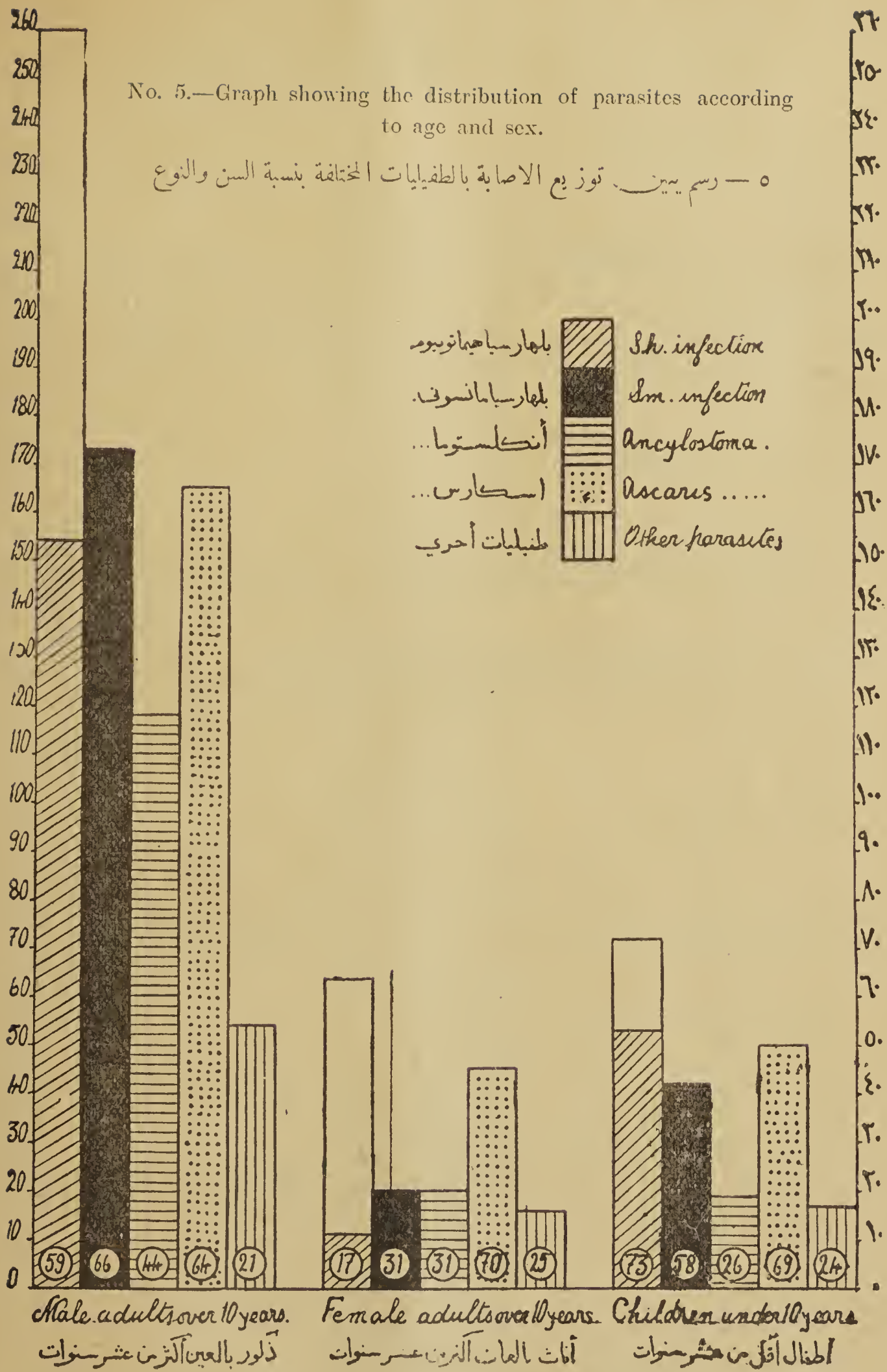
Graph. 3.

Note. Graph showing the rate of infection with the different parasites.

٤- رسم بياني نسبة الاصابة بالطفيليات المختلفة بين السكاك

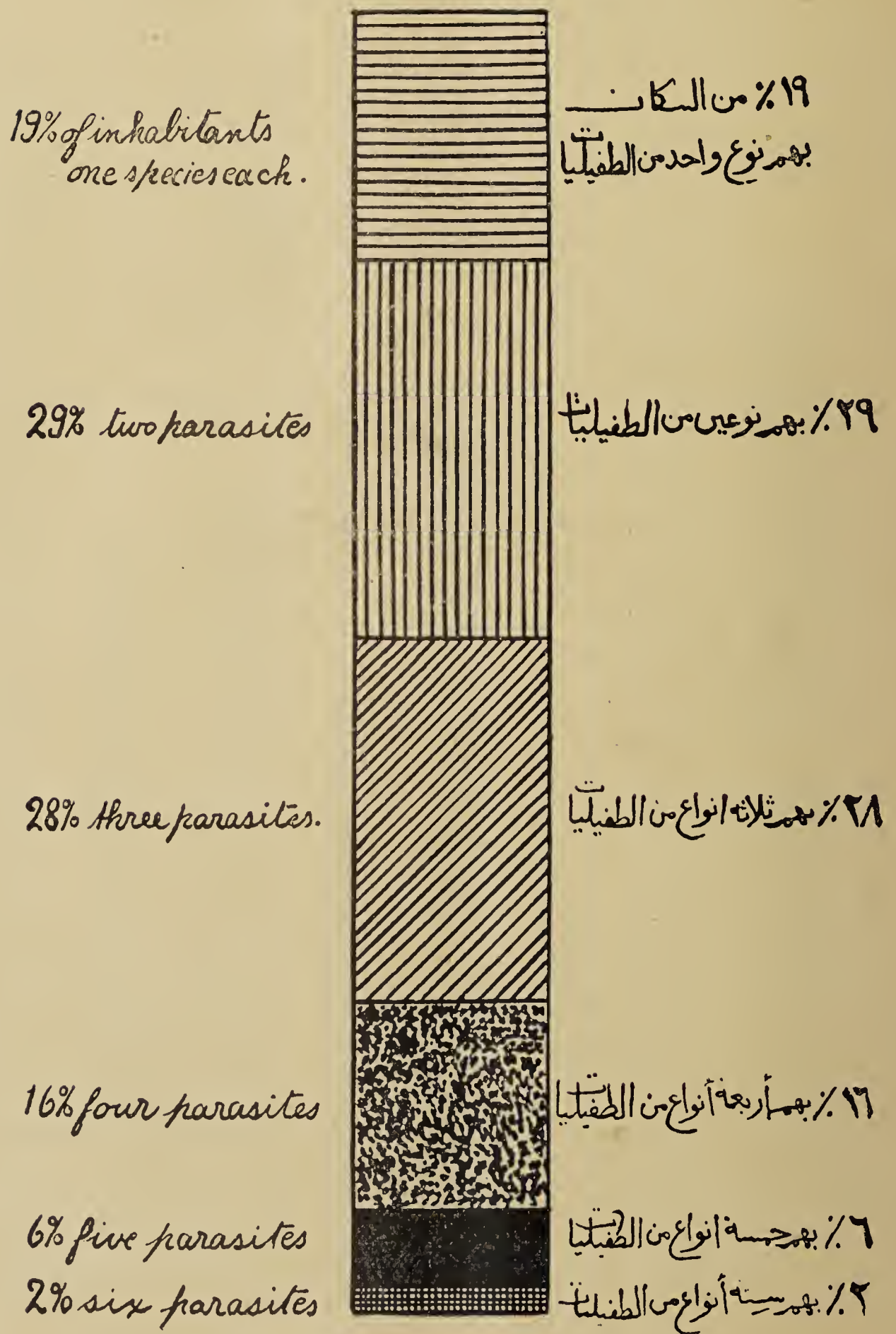






No. 6 - Number of different Species of Parasites harboured  
by inhabitants of Tanan.

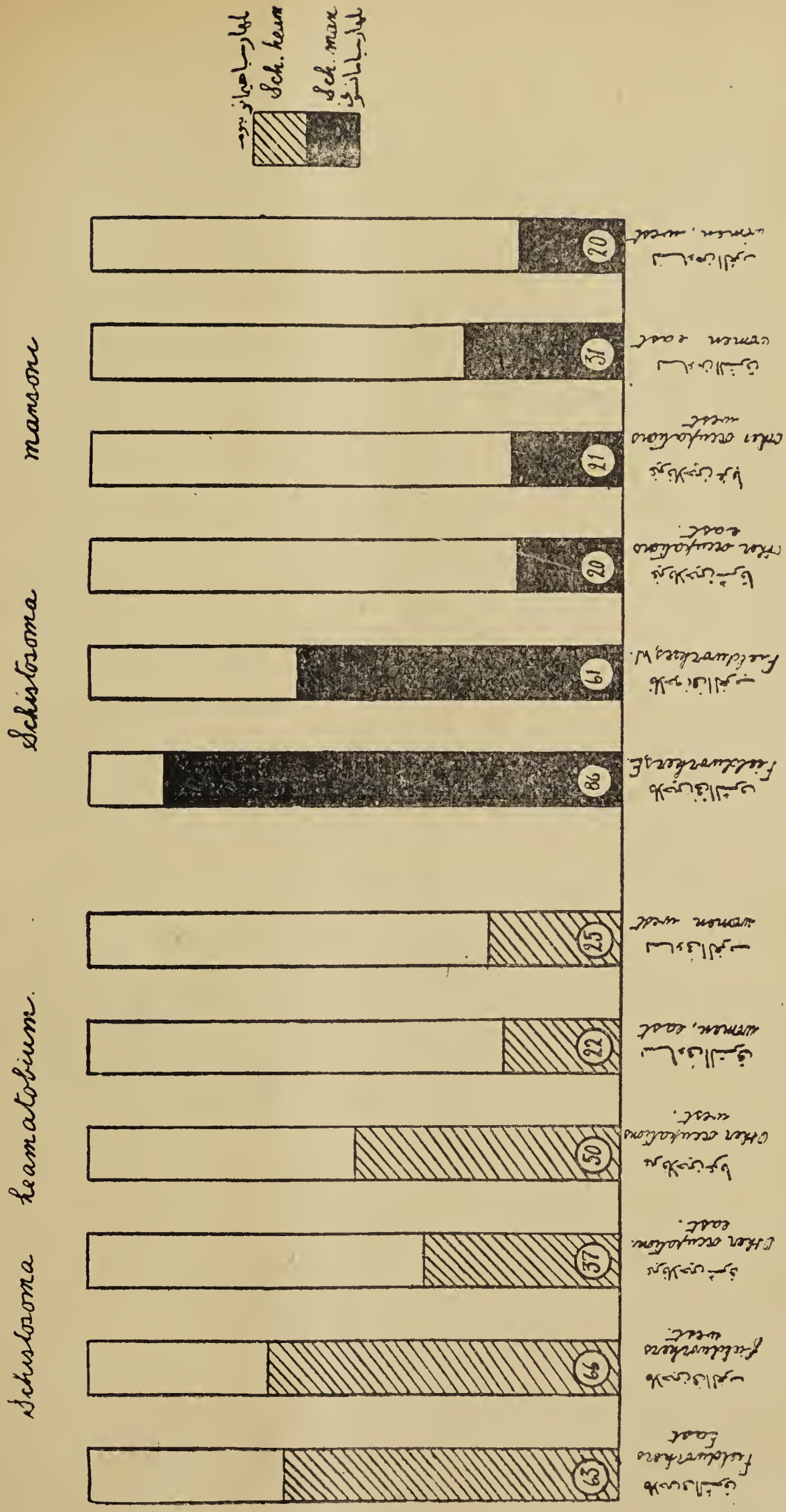
٦. رسم يبين عدد انواع الطفيليات التي تأويها سكان طنان





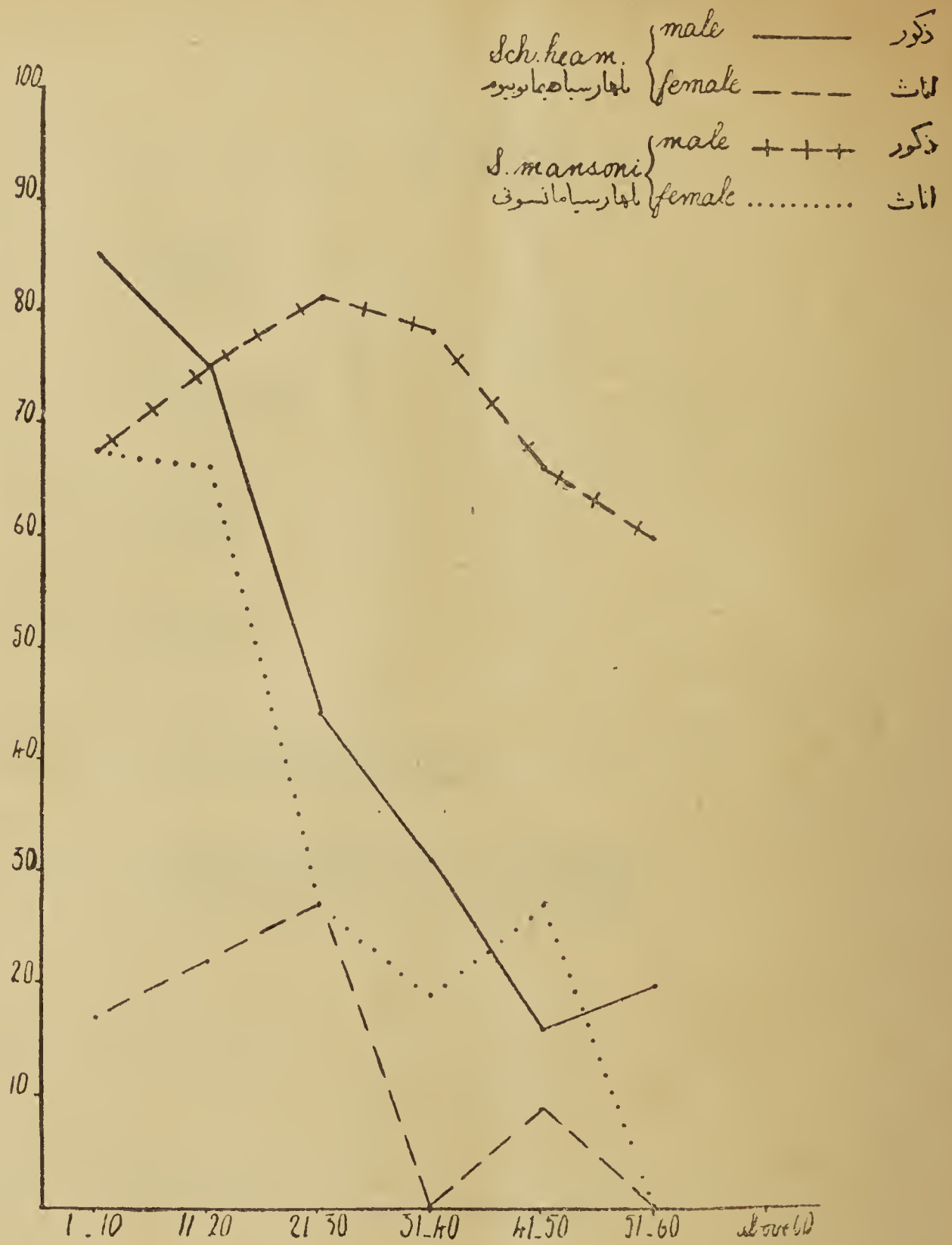
No. 7.—Graph showing the incidence of Bilharziasis among adults according to occupations.

٧. رسم بين توزيع الاصابة بالبلهارسيا بين البالغين تبعاً للمهن



Ab. 8-Graph showing the distribution of bilharzia in the eastern part according to age & sex.

٨- رسم بياني توزيع الإصابة بالملاريا في القسم الشرقي من السودان







Map 1





رسم مخطط بين الترع المنح انشاؤها شرق فوفية طرابلس

*Scheme of the New canal*



Map 2





